PROMISE®
TECHNOLOGY, INC.

VTRAK
E-Class
E610f, E610s, E310f, E310s
PRODUCT MANUAL

Version 2.0

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Chapter 1: Introduction to VTrak

This chapter covers the following topics:

- About This Manual (below)
- VTrak Overview (page 2)
- Architectural Description (page 4)
- Specifications (page 8)

Thank you for purchasing Promise Technology's VTrak E-Class external disk array subsystem.

About This Manual

This *Product Manual* describes how to setup, use and maintain the VTrak E610f, E610s, E310f, and E310s external disk array subsystems. It also describes how to use the built-in command-line interface (CLI), command-line utility (CLU) and embedded Web-based Promise Array Management—Professional (WebPAM PROe) software.

This manual includes a full table of contents, index, chapter task lists and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:

Note

A *Note* provides helpful information such as hints or alternative ways of doing a task.

Important

An *Important* calls attention to an essential step or point required to complete a task. Important items include things often missed.

Caution

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.

Warning

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

VTrak Overview

VTrak provides data storage solutions for applications where high performance and data protection are required. The failure of any single drive will not affect data integrity or accessibility of the data in a RAID protected logical drive.

Figure 1. VTrak E610f/s front view

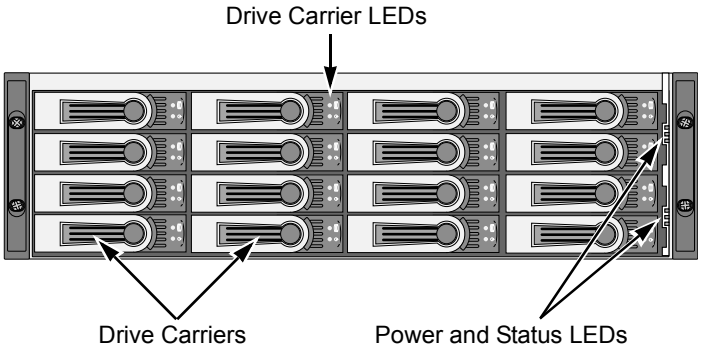
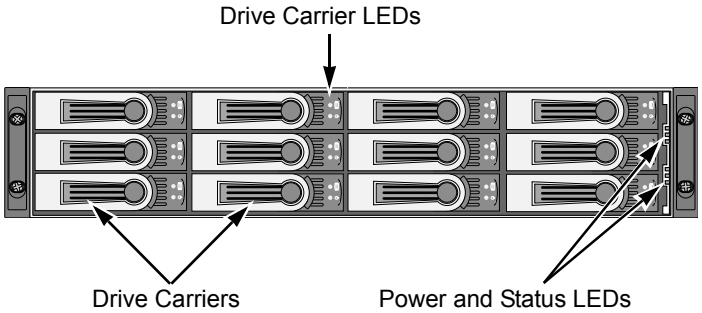


Figure 2. VTrak E310f/s front view



A defective drive may be replaced without interruption of data availability to the host computer. If so configured, a hot spare drive will automatically replace a failed drive, securing the fault-tolerant integrity of the logical drive. The self-contained hardware-based RAID logical drive provides maximum performance in a compact external chassis.

Figure 3. VTrak E610f rear view

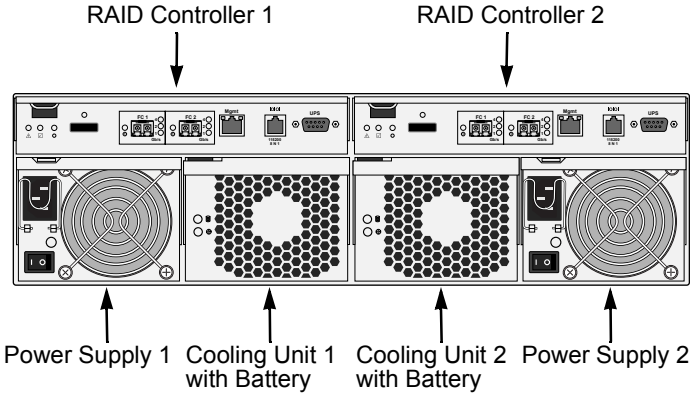


Figure 4. VTrak E610s rear view

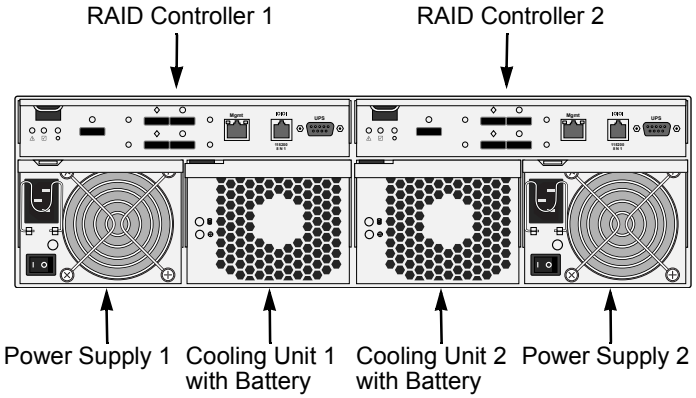


Figure 5. VTrak E310f rear view

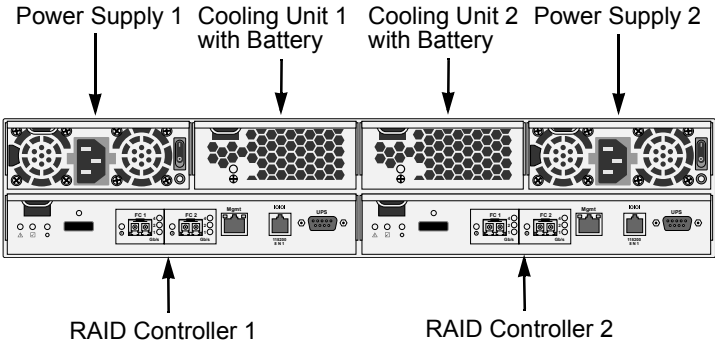
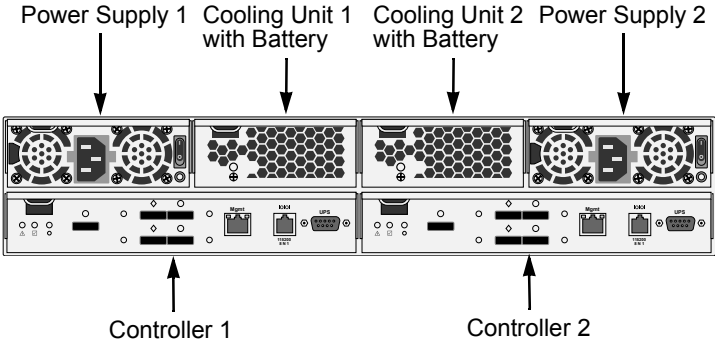


Figure 6. VTrak E310s rear view



Architectural Description

The VTrak E610f and E310f are Fibre Channel subsystems suitable for Direct Attached Storage (DAS), Storage Area Network (SAN), and Expanded Storage.

The VTrak E610s and E310s are Serial Attached SCSI (SAS) subsystems suitable for Direct Attached Storage (DAS), Cascaded Storage, and Expanded Storage.

The E-Class subsystems support:

- 1.5 Gb/s SATA disk drives
- 3.0 Gb/s SATA disk drives
- 3.0 Gb/s SAS disk drives

All E-Class enclosures include a mid-plane, RAID controller, power and cooling units, and enclosure processor all in one cable-less chassis design. Multiple fans and power supplies provide redundancy to ensure continued usage during component failure. The RAID controller is hardware based and controls all logical drive functions transparently to the host system. VTrak appears to the computer's operating system as a standard SCSI drive or drives.

Features and Benefits

Highlights

- Dual channel active/active, failover/failback RAID controllers
- E610f/s: 16 hot-swappable drive bays in a robust 3U rackmount chassis with redundant, hot-swappable power and cooling modules
- E310f/s: 12 hot-swappable drive bays in a robust 2U rackmount chassis with redundant, hot-swappable power and cooling modules
- Supports for Serial Attached SCSI (SAS) and Serial ATA (SATA) 3 Gb/s drives simultaneously in the same system—choose the drive that is best suited to your application
- Direct SATA LED support with AAMUX adapter
- Dual 4 Gb/s Fibre Channel or four 3 Gb/s SAS x4 host ports provide high-availability SAN and cluster-friendly platform
- JBOD expansion support through a 3 Gb/s SAS x4 port—up to four VTrak JBOD systems
- Simplified remote management with a comprehensive embedded web-based management via Ethernet—WebPAM PROe. Command Line Interface/Utility via RJ-11 Serial Port
- Three years complete system limited warranty includes 24 x 7 email and phone support with highly experienced technical support technicians and an advanced replacements program
- Support for the latest RAID technology—RAID 6 and 60—Protection from a catastrophic double drive failure
- Resilient data protection features such as Predictive Data Migration™ and PerfectRAID™ provide rock solid data protection
- LUN Mapping and Masking bring flexibility for multiple application and OS support on the same storage subsystem
- Open architecture, industry's most comprehensive support for SAS and SATA hard drives and standards-based management interfaces including SNMP, CIM, and WBEM

- Support for the industry standard Disk Data Format (DDF from SNIA) ensures interoperability and drive roaming even among different RAID vendors
- Compatible with leading SAS hard drives, host bus adapters and RAID controllers

Subsystem and Controller Features

Controllers: Dual-controller configuration or single-controller configuration, upgradeable to dual. Dual-controller subsystems feature Active/Active, Failover/Failback.

Drive Support: Up to 16 (E610f/s) or 12 (E310f/s) 3.5" x 1" hard disk drives: SAS 3Gb/s, SATA II 3Gb/s and 1.5Gb/s. SATA drives require an AAMUX Adapter in dual I/O module configuration (dual-controller) subsystems.

Supports any mix of SAS and SATA II 3Gb/s or 1.5Gb/s drives simultaneously in the same system. Staggered physical drive spin-up.

External I/O Ports (per controller): Dual 4-Gb Fibre Channel host port; One external 3 Gb/s SAS x4 ports for JBOD expansion (up to four VTrak JBOD Systems).

Data Cache: Shared 512 MB predictive data cache (expandable to 2 GB); Automatic write cache destaging; 72-hour battery backup (for 512 MB cache).

Command Queue Depth: 512 commands per VTrak system (up to 1024 commands with 512 MB memory).

Operational Features

RAID Levels: RAID 0, 1, 1E, 5, 6, 10, 50, and 60 – Any combination of these RAID levels can exist at the same time.

Configurable RAID stripe size: 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB stripe size per logical drive.

Background task priority tuning: Adjustment of minimum I/O reserved for server use during all background tasks.

Hot spares: Multiple global or dedicated hot-spare drives with revert option.

Maximum LUNs per subsystem: 256 in any combination of RAID levels.

Maximum LUNs per array: 32 logical drives (LUNs). Supports LUN carving by allowing an array to be divided into multiple logical drives. Supports out-of-order logical drive deletion and re-creation.

Max LUNs per Target ID: Up to 256, depending on host side driver and operating system.

LUN Masking and Mapping: Supports multiple hosts.

Disk Data Formats: Supports Disk Data Format (DDF) for industry-wide standardization and drive roaming between VTrak systems.

Background Activities: Media Patrol, background synchronizing, disk array rebuild, Redundancy Check, SMART condition pooling, Online Capacity Expansion (OCE), RAID Level Migration (RLM). Includes priority control, rate control, and watermarking per BGA in disk and NVRAM.

Foreground Activities: Disk array initialization.

Physical Drive Error Recovery: Predictive Data Migration (PDM), replaces un-healthy disk member in array, while maintaining normal array status during the data transition. Bad Sector Mapping, Media Patrol, SMART, Hard/Soft Reset to recover HD from bad status, HD Power-control to recover HD from hung status.

Array Error Recovery: Data recovery from bad sector or failed HD for redundant RAID, RAID 5/6 inconsistent data Prevent (Write Hole Table), Data content Error Prevent (Read/Write Check Table) NVRAM event logging.

SCSI Commands: Supports extensive SCSI command set equivalent to SCSI/FC hard disk drives. Variable sector size (512 byte to 4 KB) to break OS 2TB limitation. 16 byte CDB support for 64-bit LBA addressing.

Management

Supported Operating Systems: Windows 2000 Server, Windows 2003 Server, Linux (Red Hat, SuSE), Macintosh OS X, Solaris.

Management Tools: WebPAM PROe via out-of-band Ethernet. OS independent, localized in multiple languages, SSL Security support. Command Line Interface (CLI) and Command Line Utility (CLU) via RJ-11 Serial Port or Telnet.

Standard Management Protocols: SNMP, WBEM/CIM

RAID Creation: Automatic, Express, and Advanced configuration support for novice to skilled users.

Management Interfaces: WebPAM PROe, CLU, CLI, audible (buzzer) and visible (LEDs) alarms.

Management Protocols: Embedded web server and management support—no host agent needed. Ethernet, RJ-11 serial port, SNMP, SSL, Telnet, Email.

Specifications

E610f and E610s

Voltage: 100–240 VAC Auto-ranging.

Current (maximum): 8 A @ 100 VAC or 4 A @ 240 VAC Current rating with two power cords.

Power Consumption (not including disk drives): E610f, 142.12 W. E610s, 151.42 W.

Power Consumption (including disk drives): E610f, 562.65 W. E610s, 566.95 W.

Power Supply: Dual 500 W, 100-240 VAC auto-ranging, 50-60 Hz, dual hot swap and redundant with PFC, N+1 design.

Operating Temperature: 5° to 40°C operational (-40° to 60°C non-operational)

Relative Humidity: Maximum 95 percent.

Vibration: Random, 0.21 grms, 5-500 Hz, 30 Mins, X, Y, Z axis.

Dimensions (H x W x D): 13.1 x 44.6 x 56.1 cm (5.2 x 17.6 x 22.1 in)

Net Weight: 30.5 kg (67.2 lb) without drives, 38.5 kg (84.9 lb) with 16 drives, assuming 0.5 kg (1.1 lb) per drive.

Gross Weight (including carton): 37.5 kg (82.7 lb) without drives.

Safety: CE, FCC Class A, VCCI, C-Tick, cUL, TUV, CB, BSMI, MIC.

E310f and E310s

Voltage: 100–240 VAC Auto-ranging.

Current (maximum): 8 A @ 100 VAC or 4 A @ 240 VAC Current rating with two power cords.

Power Consumption (not including disk drives): E310f, 141.68 W. E310s, 157.84 W.

Power Consumption (including disk drives): E310f, 453.32 W. E310s, 469.48 W.

Power Supply: Dual 400 W, 100-240 VAC auto-ranging, 50-60 Hz, dual hot swap and redundant with PFC, N+1 design.

Operating Temperature: 5° to 40°C operational (-40° to 60°C non-operational)

Relative Humidity: Maximum 95 percent.

Vibration: Random, 0.21 grms, 5-500 Hz, 30 Mins, X, Y, Z axis.

Dimensions (H x W x D): 8.8 x 44.4 x 56.1 cm (3.5 x 17.5 x 22.1 in)

Net Weight: 22 kg (49 lb) without drives, 28 kg (62 lb) with 12 drives, assuming 0.5 kg (1.1 lb) per drive.

Gross Weight (including carton): 30 kg (66 lb) without drives.

Safety: CE, FCC Class A, VCCI, C-Tick, cUL, TUV, CB, BSMI, MIC.

Warranty and Support

Warranty: Three years complete system limited warranty.

Support: 24x7 email and phone support (English only). 24x7 access to Promise support site for drivers, firmware, and compatibility.

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE Statement

Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

MIC Statement

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Chapter 2: VTrak Installation

This chapter covers the following topics:

- Unpacking the VTrak (below)
- Mounting VTrak E610f/s in a Rack (page 12)
- Mounting VTrak E310f/s in a Rack (page 14)
- Installing Disk Drives (page 17)
- Making Management and Data Connections (page 21)
- Making Serial Cable Connections (page 32)
- Connecting the Power (page 33)

Unpacking the VTrak

The VTrak box contains the following items:

- VTrak Unit
- *Quick Start Guide*
- Front bezel and key
- Left and right center-mount brackets
- Left and right mounting rails
- RJ11-to-DB9 serial data cable
- Screws for disk drives
  (E610f/s: 70, including 6 spares)
  (E310f/s: 50, including 2 spares)
- 1.5m (4.9 ft) Power cords (2)
- CD with SNMP files, *Product Manual* and *Quick Start Guide*

Warning

The electronic components within the VTrak disk array are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the VTrak or its subassemblies.

Important

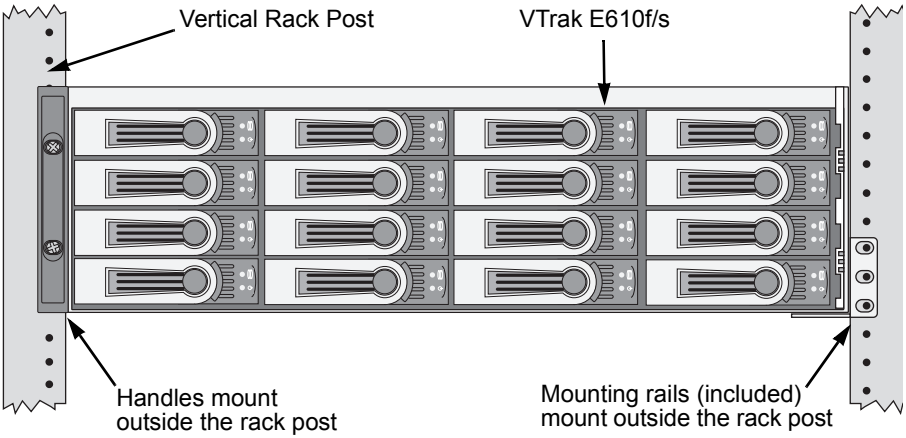
Use the following categories of network cables with VTrak:

- Cat 6, preferred
- Cat 5E, minimum

Mounting VTrak E610f/s in a Rack

The E610f/s subsystem installs to the rack using the supplied mounting rails. You can also use your existing rails.

Figure 1. VTrak E610f/s mounted in a rack with the supplied rails


Vertical Rack Post
VTrak E610f/s
Handles mount outside the rack post
Mounting rails (included) mount outside the rack post

Cautions

- At least two persons are required to safely lift, place, and attach the VTrak subsystem into a rack system.
- Do not lift or move the VTrak subsystem by the handles, power supplies or the controller units. Hold the subsystem itself.
- Do not install the VTrak subsystem into a rack without rails to support the subsystem.
- Only a qualified electrician who is familiar with the installation procedure should mount and install the VTrak subsystem.
- Be sure all switches are OFF before installing the VTrak subsystem or exchanging components.

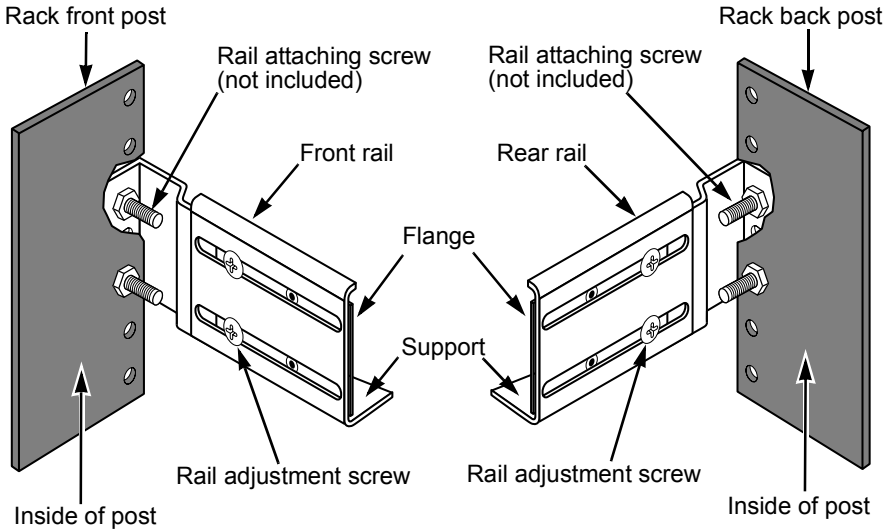
To install the E610f/s subsystem into a rack with the supplied mounting rails:

1. Check the fit of the mounting rails in your rack system. See Figure 2.
2. Adjust the length of the mounting rails as needed.
3. Attach the mounting rail assemblies to the outside of the rack posts, using the attaching screws from your rack system.

   Be sure the support is on the bottom facing inward.

4. Square the rail assemblies in the rack.
5. Tighten the adjustment screws and the attaching screws.
6. Place the VTrak subsystem onto the rails.
7. Secure the VTrak subsystem to the rack through each handle, using the attaching screws from your rack system.

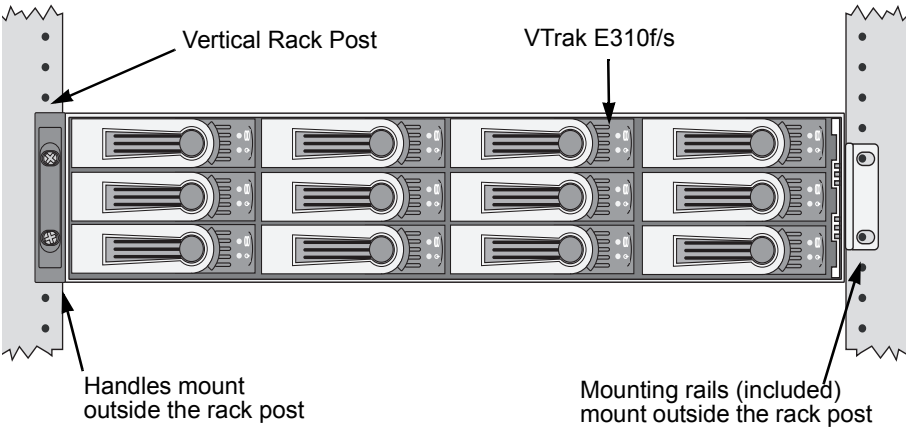
Figure 2. Rack mount assembly diagram



Mounting VTrak E310f/s in a Rack

The E-Class subsytems installs to the rack using the supplied mounting rails. You can also use your existing rails.

Figure 3. VTrak E310f/s mounted in a rack with the supplied rails


Vertical Rack Post
VTrak E310f/s
Handles mount outside the rack post
Mounting rails (included) mount outside the rack post

Cautions

- At least two persons are required to safely lift, place, and attach the VTrak subsystem into a rack system.
- Do not lift or move the VTrak subsystem by the handles, power supplies or the controller units. Hold the subsystem itself.
- Do not install the VTrak subsystem into a rack without rails to support the subsystem.
- Only a qualified electrician who is familiar with the installation procedure should mount and install the VTrak subsystem.
- Be sure all switches are OFF before installing the VTrak subsystem or exchanging components.

To install the VTrak subsystem into a rack with the supplied mounting rails:

1. Check the fit of the mounting rails in your rack system. See Figure 5.
2. Slide the plates out of the mounting rails.
3. Attach one plate to each side of the VTrak subsystem.

   Line-up the six holes in the plate with the corresponding holes in the subsystem. Attach each plate with six screws (included). See Figure 4.
4. Slide one of the rails over the plate on one side of the enclosure.

The rail is designed to slide freely over the plate.

5. Attach a flange to each end of the rail, with the rail on the opposite side of the flange from the two-hole bracket.
6. Install the rail adjustment screws (included) through the flange into the rail.

   There are four screws for each flange. See Figure 5.
7. Place the subsystem with mounting rails into your rack system.
8. Attach the mounting rail assemblies to the outside of the rack posts, using the attaching screws from your rack system.
9. Square the rail assemblies in the rack.
10. Tighten the adjustment screws and the attaching screws.
11. Place the VTrak subsystem onto the rails.
12. Secure the VTrak subsystem to the rack through each handle, using the attaching screws from your rack system.

Figure 4. Sliding flange installation

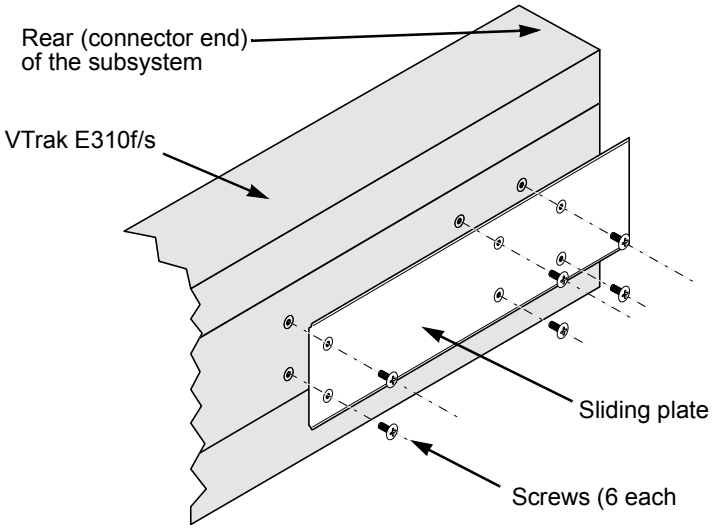
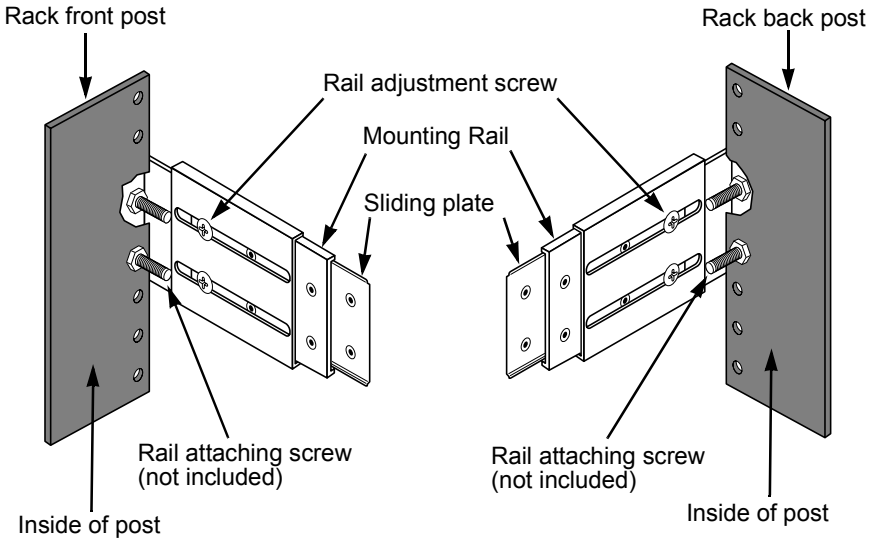


Figure 5. Mounting rail installation



Installing Disk Drives

You can populate the VTrak with SAS or SATA hard disk drives. For optimal performance, install physical drives of the same model and capacity. The drives' matched performance allows the logical drive to function better as a single drive. The table below shows the number of drives required for each RAID level.

Level	Number of Drives		Level	Number of Drives
RAID 0	1 or more		RAID 6	4 to 16*
RAID 1	2 only		RAID 10	4 or more**
RAID 1E	2 or more		RAID 50	6 or more
RAID 5	3 to 16*		RAID 60	8 or more

* E310f/s: Drive counts above 12 require an expansion unit.
** Must be an even number of drives.

Drive Slot Numbering

You can install any suitable disk drive into any slot in the enclosure. The diagram below shows how VTrak's drive slots are numbered. Slot numbering is reflected in the WebPAM PROe and CLU user interfaces.

Figure 6. VTrak E610f/s drive slot numbering

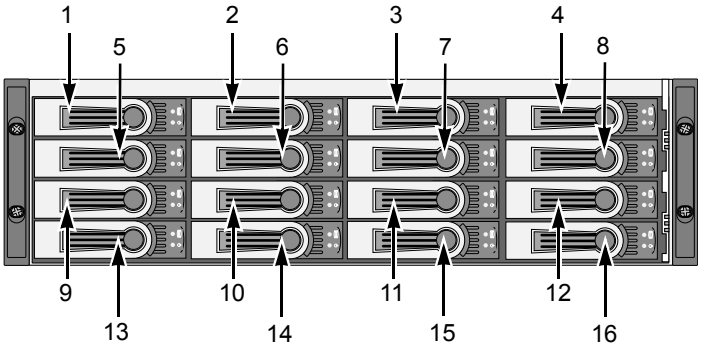
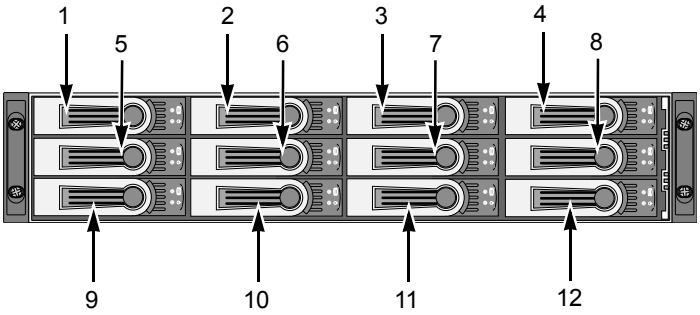


Figure 7. VTrak E310f/s drive slot numbering



Install all of the drive carriers into the VTrak enclosure to ensure proper airflow, even if you do not populate all the carriers with disk drives.

AAMUX Adapter

If your VTrak has dual controllers—Fibre Channel or SAS—and you plan to install SATA drives, you **must** install an AAMUX adapter with each SATA drive. AAMUX adapters are available from Promise Technology.

Installing Disk Drives

1. Remove a disk drive carrier.
2. SATA drives only. Place the AAMUX adapter into the disk drive carrier and attach it with the four screws. See Figure 9.
   - Install only the screws supplied with the adapter.
   - The adapter fits into the carrier with the SAS connector at the back.
   - Snug each screw. Be careful not to over tighten.
3. Carefully lay the disk drive into the drive carrier at the front, so that the screw holes on the bottom line up.

   If you installed an AAMUX adapter, lay the SATA disk drive into the carrier and slide it so the power and data connectors insert in to the adapter.
4. Insert the screws through the holes in the drive carrier and into the bottom of the disk drive. See Figure 8.
   - Install only the counter-sink screws supplied with the VTrak.
   - Install four screws per drive.
   - Snug each screw. Be careful not to over-tighten.
5. Reinstall the drive carrier into the VTrak chassis.

Repeat steps 2 through 5 until all of your disk drives are installed.

Figure 8. Disk drive mounting holes in the drive carrier

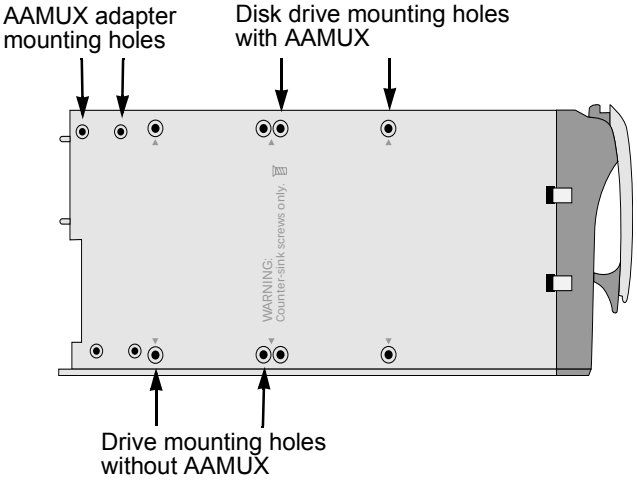


Figure 9. SATA drive mounted in a drive carrier with the AAMUX adapter

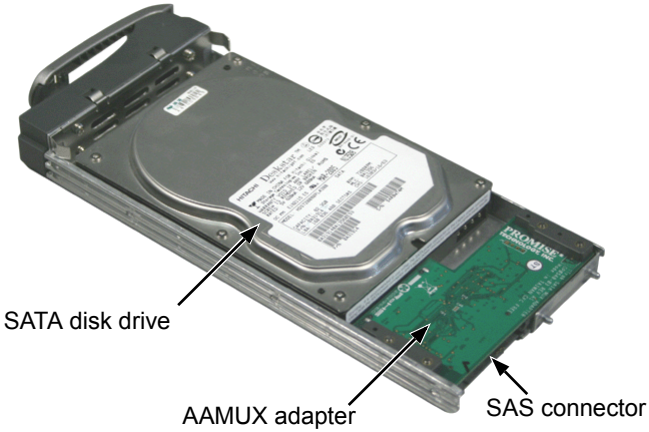


Figure 10. SAS drive mounted in a drive carrier

Making Management and Data Connections

For Serial Attached SCSI setup, go to page 26.

Fibre Channel

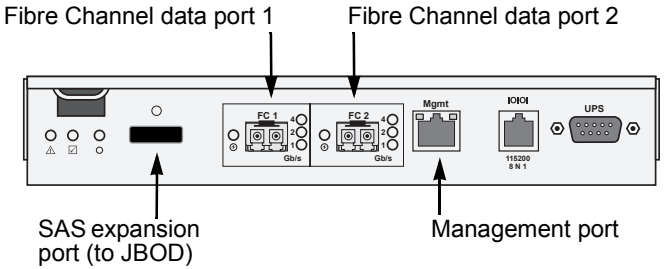
VTrak models can have one or two RAID controllers. Each controller has an Ethernet (RJ45) Management Port connector that enables you to monitor the VTrak over your network using the WebPAM PROe Software. VTrak supports HTTP(S) and Telnet protocols.

The VTrak E610f and E310f RAID controllers have two 4-Gb Fibre Channel (FC) connections for the data ports. See Figure 11.

You can configure your VTrak for:

- Storage Area Network (SAN)
- Direct Attached Storage (DAS)
- JBOD Expansion using a SAS data connection

Figure 11. VTrak E610f and E310f controller data and management connectors



Configuring a Storage Area Network

A storage area network (SAN) requires:

- A Fibre Channel switch
- A Fibre Channel HBA card in each Host PC or Server
- A network switch
- A network interface card (NIC) in each Host PC or Server

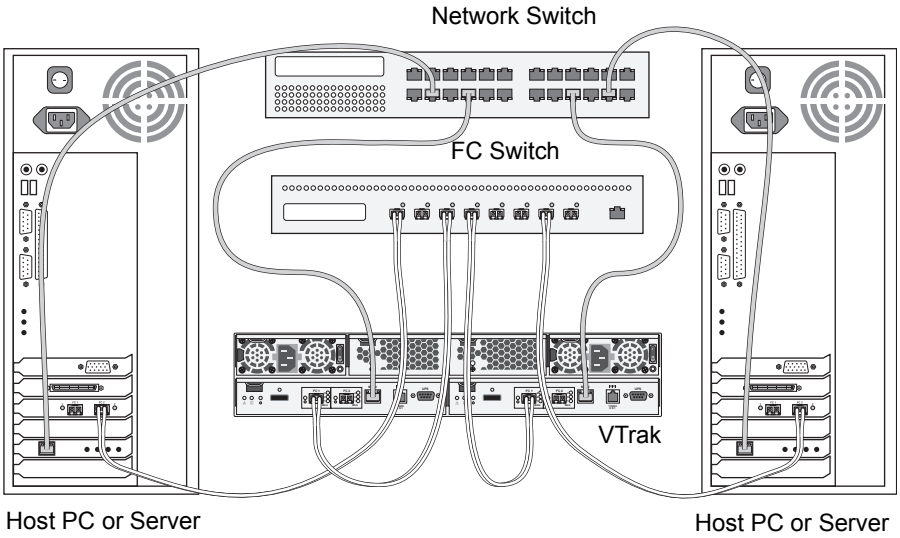
To establish the data path:

On the VTrak controller, connect one of the Fibre Channel data ports to your Fibre Channel switch.

To establish the management path:

1. On the VTrak controller, connect the Management Port to your network switch. Figure 12.
2. Connect each Host PC's or Server's standard NIC to your network switch.

Figure 12. SAN data and management connections. The E310f is shown. The E610f is similar



Configuring Direct Attached Storage

Direct attached storage (DAS) requires:

- Two Fibre Channel HBA cards in the Host PC or Server
- A network switch
- A network interface card (NIC) in the Host PC or Server

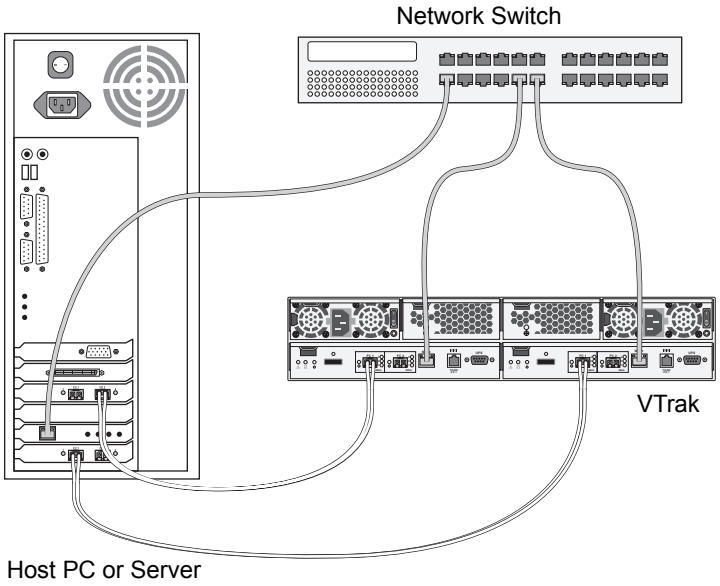
To establish the data path:

On the VTrak controller, connect one of the Fibre Channel data ports to your Fibre Channel switch. See Figure 13.

To establish the management path:

1. On the VTrak controller, connect the Management Port to your network switch. See Figure 13.
2. Connect the Host PC's or Server's standard NIC to your network switch.

Figure 13. DAS data and management connections. The E310f is shown. The E610f is similar

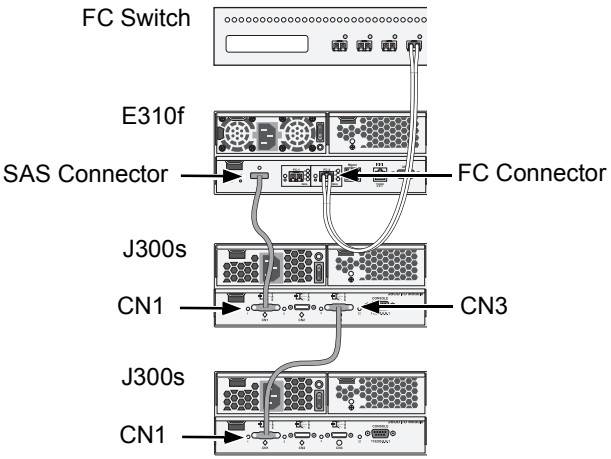


Configuring JBOD Expansion

To expand the number of disk drives:

1. On the E610f or E310f controller, connect the SAS connector (a subtractive-routed port) to CN1 (a table-routed port) on the I/O module of the first J300s unit. See Figure 14.
2. Connect CN3 (a subtractive-routed port) on the first J300s unit to CN1 on one of the I/O modules of the next J300s unit.
3. Connect the remaining J300s units in the same manner.

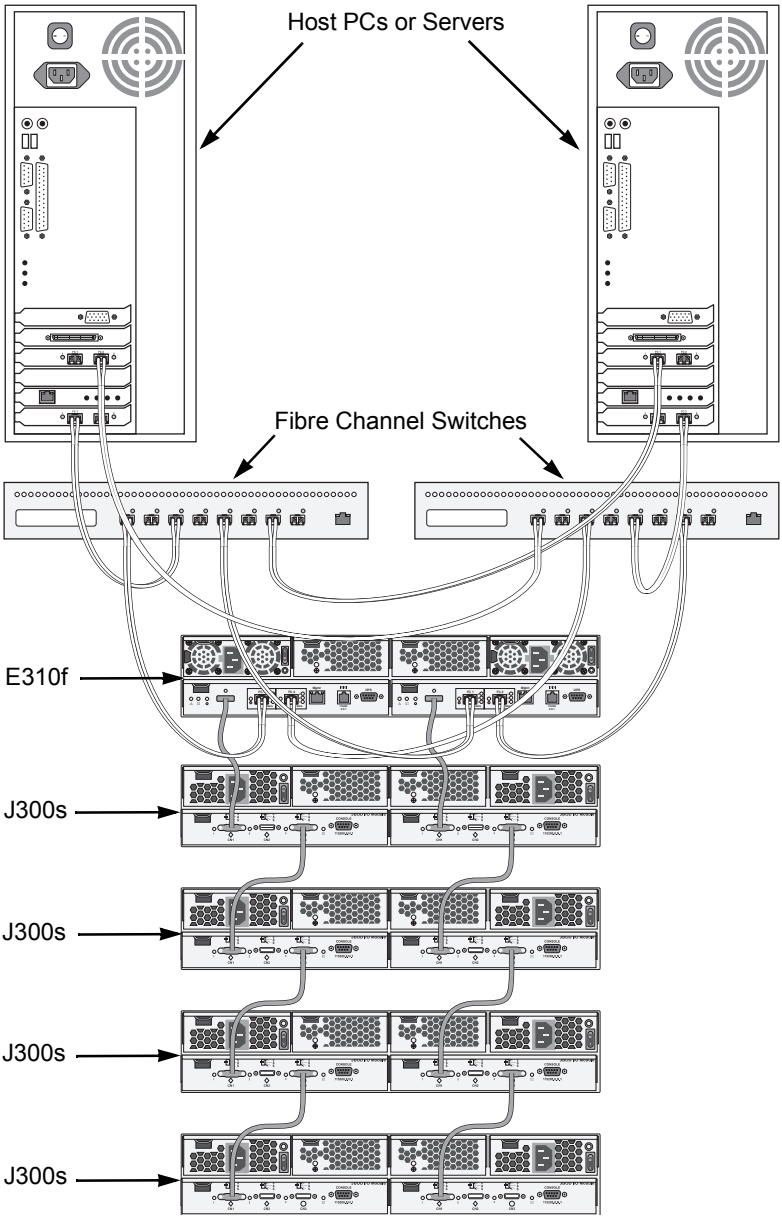
Figure 14. JBOD data connections. The E310f is shown. The E610f is similar



You can expand a SAN system with no single point of failure. See Figure 15. Such an arrangement requires:

- Two Fibre Channel switches
- Two Fibre Channel HBA cards in each Host PC or Server
- A network switch (not shown)
- A network interface card (NIC) in each Host PC or Server

Figure 15.JBOD expansion with no single point of failure



This completes management and data connections for VTrak E610f and E310f. Go to “Making Serial Cable Connections” on page 32.

Serial Attached SCSI

VTrak models can have one or two RAID controllers. Each controller has an Ethernet (RJ45) Management Port connector that enables you to monitor the VTrak over your network using the WebPAM PROe Software. VTrak supports HTTP(S) and Telnet protocols.

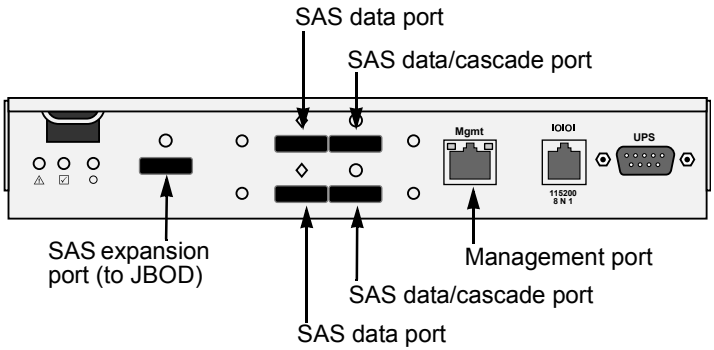
The standard VTrak E610s and E310s controllers have five SAS ports:

- Data ports (2) – Connects to the Host PC or Server
- Data/Cascade ports (2) – Connects to the data port of a second E310s controller or to the Host PC or Server
- SAS Expansion port (1) – Connects to a VTrak J300s JBOD expansion subsystem

You can configure your VTrak for:

- Direct Attached Storage (DAS)
- Cascaded Storage (Multiple E610s or E310s subsystems)
- JBOD Expansion using a SAS data connection

Figure 16. VTrak E610s and E310s controller data and management connectors



Configuring Direct Attached Storage

Direct attached storage (DAS) requires:

- Two SAS HBA cards in the Host PC or Server
- A network switch
- A network interface card (NIC) in the Host PC or Server

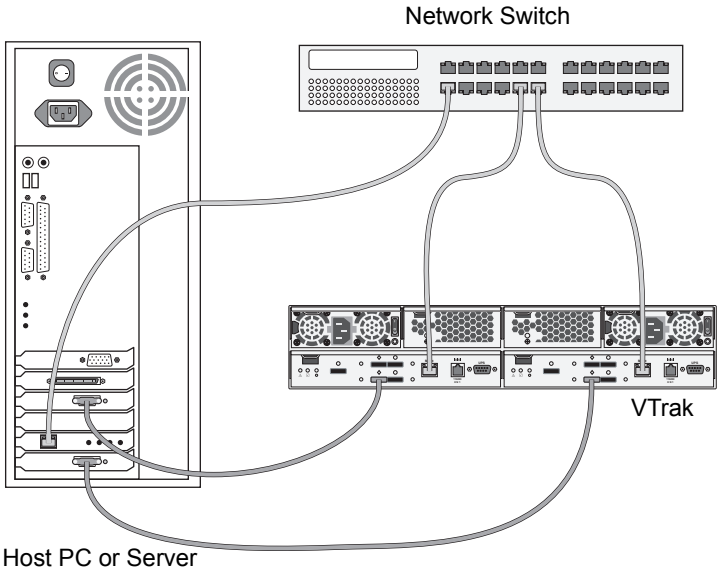
To establish the data path:

On the VTrak controller, connect a SAS data port or a SAS data/cascade port to one of your SAS HBA cards. See Figure 17.

To establish the management path:

1. On the VTrak controller, connect the Management Port on each Controller to your network switch. See Figure 17.
2. Connect the Host PC's or Server's standard NIC to your network switch.

Figure 17. DAS data and management connections. The E310s is shown. The E610s is similar



Configuring Cascaded Storage

Cascaded storage requires:

- One SAS HBA card in the Host PC or Server
- A network switch
- A network interface card (NIC) in the Host PC or Server

To establish the data path:

1. On the VTrak controller, connect a SAS data port or a SAS data/cascade port to your SAS HBA card. See Figure 18.
2. Connect the data/cascade port (a subtractive-routed port) of the first E610s or E310s to the data port (a table-routed port) on the second E310s.
3. Connect the remaining E610s or E310s controllers in the same manner.

   You can cascade up to eight VTrak subsystems.

To establish the management path:

1. On the VTrak controller, connect the Management Port on each Controller to your network switch. See Figure 19.
2. Connect the Host PC's or Server's standard NIC to your network switch.

Figure 18. Cascaded data connections. The E310s is shown. The E610s is similar

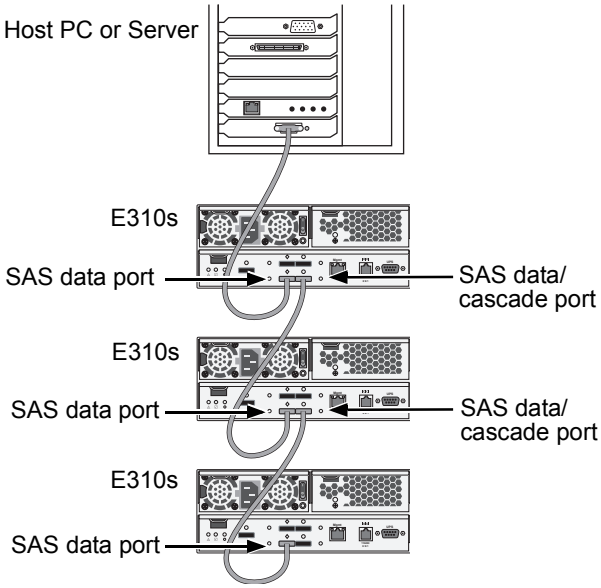
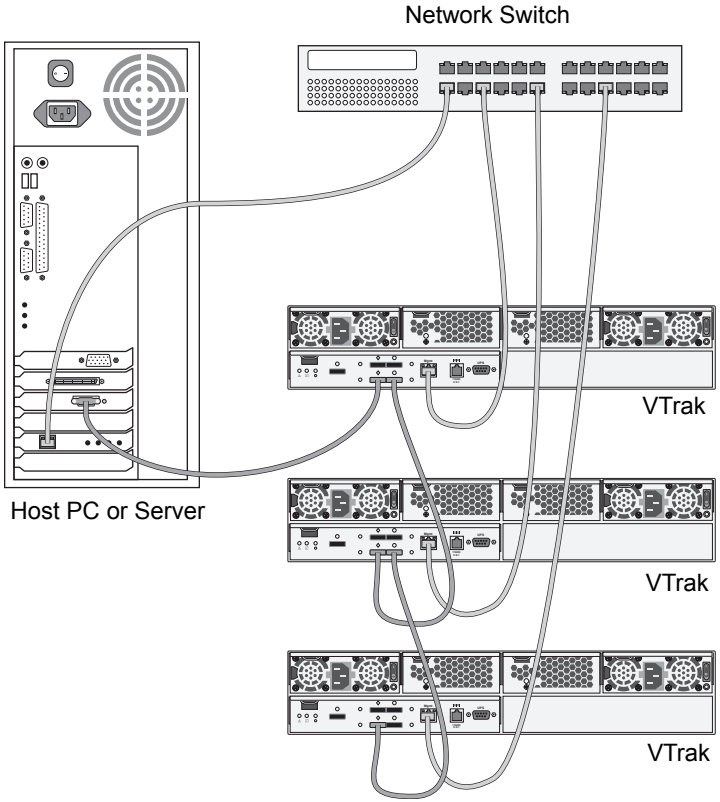


Figure 19. Cascaded management and data connections. The E310s is shown. The E610s is similar

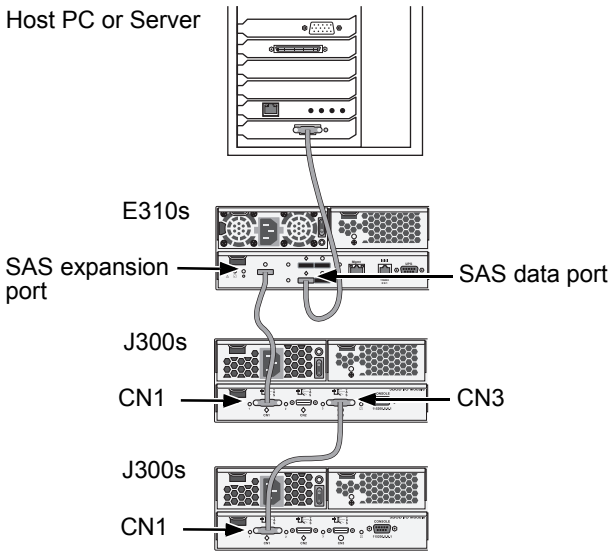


Configuring JBOD Expansion

To expand the number of disk drives:

1. On the E610s or E310s controller, connect the SAS expansion port (a subtractive-routed port) to the CN1 (a table-routed port) on one of the I/O modules of the first J300s unit. See Figure 20.
2. Connect CN3 (a subtractive-routed port) on the first J300s unit to CN1 on one of the I/O modules of the next J300s unit.
3. Connect the remaining J300s units in the same manner.

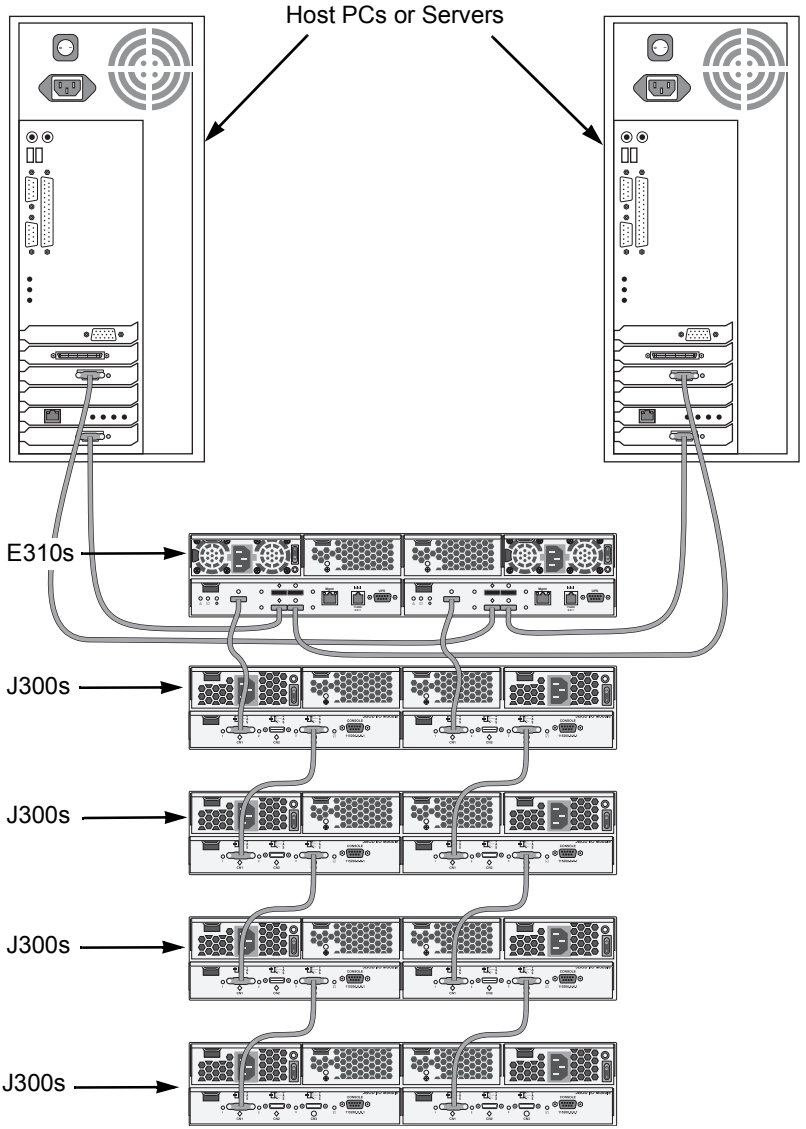
Figure 20. JBOD data connections. The E310s is shown. The E610s is similar



You can expand a SAN system with no single point of failure. See Figure 21. Such an arrangement requires:

- Two SAS HBA cards in each Host PC or Server
- A network switch (not shown)
- A network interface card (NIC) in each Host PC or Server
- One to four VTrak J300s JBOD subsystems

Figure 21. JBOD expansion with no single point of failure

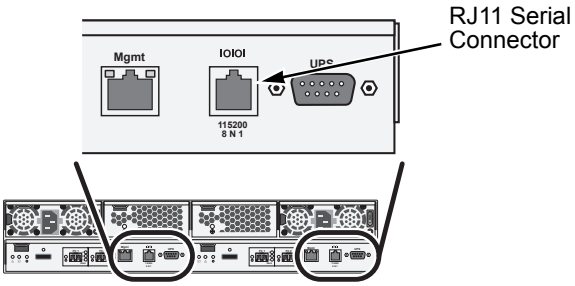


This completes Network and Data connections for VTrak E610s and E310s. Go to “Making Serial Cable Connections” on page 32.

Making Serial Cable Connections

RS232 serial communication enables the Command Line Interface (CLI) and Command Line Utility (CLU) on your PC to monitor and control the VTrak. On VTrak, RS232 communication goes through the RJ11 serial connector on each controller.

Figure 22. Serial communication goes through the RJ11 connector. The E310f is shown. The E610f, E610s, and E310s are similar



To set up a serial cable connection:

1. Attach the RJ11 end of the RJ11-to-DB9 serial data cable, supplied with the VTrak, to the RJ11 serial connector on one of the controllers.
2. Attach a null-modem cable to the DB9 end of the RJ11-to-DB9 serial data cable.
3. Attach the other end of the null-modem cable to a serial port on the Host PC or Server.

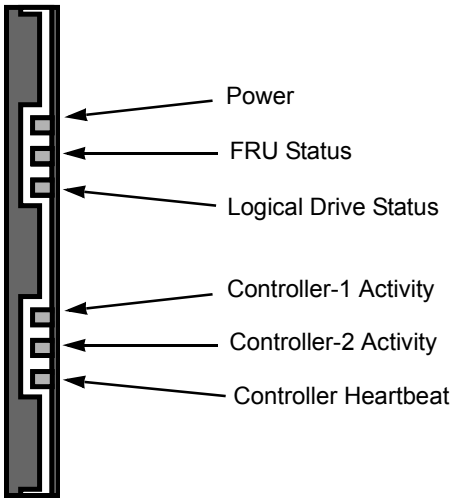
Note

The DB9 connector on the VTrak controller is for a UPS support, which is planned for a future release.

Connecting the Power

Plug the power cords and switch on both power supplies on. When the power is switched on, the LEDs on the front of the VTrak will light up.

Figure 23. VTrak front panel LED display. The E310f/s display is shown. The E610f/s display is similar

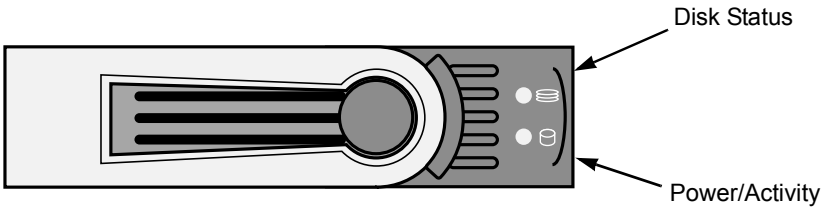


When boot-up is finished and the VTrak is functioning normally:

- Controller LED blinks green once per second for five seconds, goes dark for ten seconds, then blinks green once per second for five seconds again.
- Power, FRU and Logical Drive LEDs display green continuously.
- Controller LEDs flash green if there is activity on that controller.

There are two LEDs on each disk drive carrier. They report the presence of power and a disk drive, and the current condition of the drive.

Figure 24. VTrak disk drive carrier LEDs



After a few moments the Power/Activity LED should display Green. If there is no disk drive in the carrier, the Power/Activity LED will remain dark.

The Power/Activity LED flashes during drive activity.

The Disk Status LED displays Green when a drive is present and configured.

Go to “Chapter 3: VTrak Setup” on page 35.

Chapter 3: VTrak Setup

This chapter covers the following topics:

- Setting up the Serial Connection (below)
- Choosing DHCP or a Static IP Address (page 36)
- Setting up VTrak with the CLI (page 37)
- Setting up VTrak with the CLU (page 39)
- Creating Disk Arrays with WebPAM PROe (page 42)

Setting up the Serial Connection

VTrak has a Command Line Interface (CLI) to manage all of its functions, including customization. A subset of the CLI is the Command Line Utility (CLU), a user-level interface that manages your VTrak via your PC's terminal emulation program, such as Microsoft HyperTerminal. This procedure uses the serial cable connection you made. See "Making Serial Cable Connections" on page 32.

1. Change your terminal emulation program settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: none
2. Start your PC's terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.
4. At the Login prompt, type **administrator** and press Enter.
5. At the Password prompt, type **password** and press Enter.

   At this point, you are in the CLI. You can continue using the CLI to make network settings or you can switch to the CLU. Go to:
   - Setting up VTrak with the CLI (page 37)
   - Setting up VTrak with the CLU (page 39)

Choosing DHCP or a Static IP Address

When you setup your VTrak, you have the option of:

- Enabling DHCP and letting your DHCP server assign the IP address to the VTrak's virtual management port.
- Specifying a static IP address for the VTrak's virtual management port.

If you choose to enable DHCP, have your Network Administrator dedicate an IP address for the VTrak, linked to the VTrak's MAC address. This action will prevent the DHCP server from assigning a new IP address when the VTrak restarts, with the result that users can no longer log in.

To access the MAC address for VTrak's virtual management port:

- In the CLI, type **net -v** and press Enter.
- In the CLU Main Menu, highlight *Network Management* and press Enter. Then highlight *Virtual* and press Enter.

Setting up VTrak with the CLI

1. Type the following string to set the system date and time, then press Enter.

   administrator@cli> **date -a mod -d 2006/08/25 -t 14:50:05**

   In the above example, the date and time are included as examples only. Your values will be different. Use yyyyy/mm/dd for the date and a 24-hour clock for the time.

2. Type the following string to set the Management Port IP address and other settings, then press Enter.

   administrator@cli> **net -a mod -t mgmt -s "primaryip=192.168.10.85, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

   In the above example, the IP addresses and subnet mask are included as examples only. Your values will be different.

   If you prefer to let your DHCP server assign the IP address, type the following string, then press Enter.

   administrator@cli> **net -a mod -t mgmt -s "dhcp=enable"**

   Note that the IP address described above belongs to the VTrak subsystem, not to the RAID controller. Use this IP address to log into the VTrak over your network.

3. To verify the settings, type **net** and press Enter.

   administrator@cli> **net**

   ```
   ==========================================
   CId   Port Type  IP             Mask          Gateway       Link
   ==========================================
   Virtual    Mgmt  192.168.10.85  255.255.255.0 192.168.10.1  Up
   ```

   Each RAID controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See “Controller Enters Maintenance Mode” on page 298 for more information.

4. Type the following string to set the Maintenance Mode IP address and other settings, then press Enter. You must set each controller separately.

   administrator@cli> **net -a mod -t mgmt -m -c 1 -s "primaryip=192.168.10.101, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

   administrator@cli> **net -a mod -t mgmt -m -c 2 -s "primaryip=192.168.10.102, primaryipmask=255.255.255.0, gateway=192.168.10.1"**

In the above example, the IP addresses and subnet mask are included as examples only. Your values will be different.

If you prefer to let your DHCP server assign the IP addresses, type the following strings, then press Enter.

administrator@cli> **net -a mod -t mgmt -m -c 1 -s "dhcp=enable"**

administrator@cli> **net -a mod -t mgmt -m -c 2 -s "dhcp=enable"**

Note that the IP address described above belongs to the RAID controller, not to the VTrak subsystem. Use this IP address to log into the controller over your network.

5. To verify the maintenance mode settings, type **net -m** and press Enter.

administrator@cli> **net -m**

CtrlId: 1	Port: 1
Type: Management Ethernet	IPType: IPv4
IP: 192.168.10.101	IPMask: 255.255.255.0
MAC: 00:01:55:AE:02:AE	DNS: 0.0.0.0
Gateway: 192.168.10.1	DHCP: Disabled

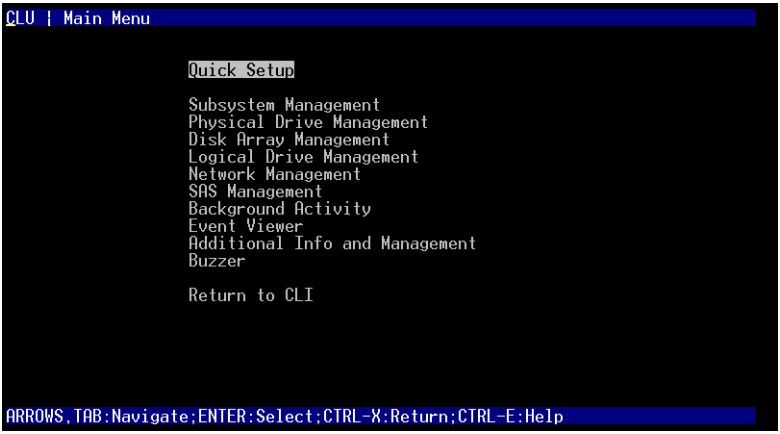
This completes the Management port setup. Go to “Creating Disk Arrays with WebPAM PROe” on page 42.

To see the full set of CLI commands, at the admin@cli> prompt, type **help** and press Enter.

Setting up VTrak with the CLU

1. At the administrator@cli> prompt, type **menu** and press Enter.
   The CLU main menu appears.

Figure 1. CLU main menu



2. With *Quick Setup* highlighted, press Enter.
   The first Quick Setup screen enables you to make Date and Time settings.

Setting system date and time

1. Press the arrow keys to highlight *System Date*.
2. Press the backspace key to erase the current date.
3. Type the new date.
4. Follow the same procedure to set the System Time.
5. Press Ctrl-A to save these settings and move to the Management Port configuration screen.

Making Management Port settings

By default, DHCP is disabled on VTrak and the default Management Port IP address is set to 10.0.0.2.

Note that the IP address described here belongs to the VTrak subsystem, not to the RAID controller. Use this IP address to log into the VTrak over your network.

Manual IP settings

To make Management Port settings manually:

1. Press the arrow keys to highlight *IP Address*.

2. Press the backspace key to erase the current IP Address.
3. Type the new IP Address.
4. Follow the same procedure to specify the Subnet Mask, Gateway IP Address and DNS Server IP Address.

   If you do not have a DNS server, skip the DNS Server IP address.
5. Press Ctrl-A to save your settings.

Automatic IP settings

To make Management Port settings automatically:

1. Press the arrow keys to highlight *DHCP*.
2. Press the spacebar to toggle to *Enable.*
3. Press Ctrl-A to save these settings.

Viewing IP address and settings

To view the current IP address and network settings when using DHCP:

1. Press the arrow keys to highlight *DHCP*.
2. Press the spacebar to toggle to *Disable*.

   The current Management Port settings are displayed.
3. Press the spacebar to toggle DHCP back to *Enable*.
4. Press Ctrl-A to save these settings and move to the RAID configuration screen.

Making Controller Maintenance Mode Settings

Each RAID controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See “Controller Enters Maintenance Mode” on page 298 for more information.

Note that the IP address described here belongs to the RAID controller, not to the VTrak subsystem. Use this IP address to log into the controller over your network.

Making Automatic Settings

1. From the CLU Main Menu, highlight *Network Management* and press Enter.
2. Highlight *Maintenance Mode Network Configuration* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *DHCP* and press the spacebar to toggle to *Enabled*.
5. Press Ctrl-A to save your settings.

Making Manual Settings

1. From the CLU Main Menu, highlight *Network Management* and press Enter.
2. Highlight *Maintenance Mode Network Configuration* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *DHCP* and press the spacebar to toggle to *Disabled*.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
   - IP Address
   - Subnet Mask
   - Default Gateway IP Address
   - DNS Server IP Address
6. Press Ctrl-A to save your settings.

Exiting the CLU

1. Highlight *Skip the Step and Finish* and press Enter.
2. Highlight *Return to CLI* and press Enter.

This completes the Management Port setup. Go to “Creating Disk Arrays with WebPAM PROe” on page 42.

Creating Disk Arrays with WebPAM PROe

Note

You can also use the CLU to create disk arrays and logical drives. See Chapter 5 of the *VTrak E-Class Product Manual* for more information.

Setting up disk arrays with WebPAM PROe consists of the following actions:

- Logging into WebPAM PROe (below)
- Selecting a Language (page 44)
- Creating a Disk Array (page 44)
- Logging out of WebPAM PROe (page 48)
- Using WebPAM PROe over the Internet (page 49)
- Obtaining a Security Certificate (page 49)

Logging into WebPAM PROe

1. Launch your Browser.
2. In the Browser address field, type in the IP address of the VTrak subsystem.

   Use the IP address you set in the CLI (page 37) or CLU (page 39). Note that the IP address shown below is only an example. The IP address you type into your browser will be different.

Regular Connection

- WebPAM PROe uses an HTTP connection. . . . . .http://
- Enter the VTrak's Management Port IP address 192.168.10.85

Together, your entry looks like this:

http://192.168.10.85

Secure Connection

- WebPAM PROe uses a secure HTTP connection. . . . . .https://
- Enter the VTrak's Management Port IP address 192.168.10.85

Together, your entry looks like this:

https://192.168.10.85

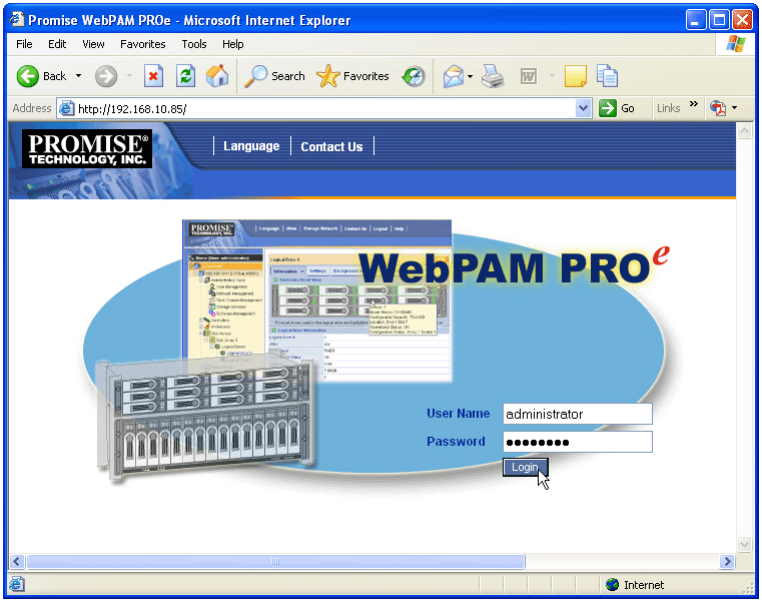
Note

Whether you select a regular or a secure connection, your login to WebPAM PROe and your user password are always secure.

3. When the log-in screen (Figure 2) appears:
   - Type **administrator** in the User Name field.
   - Type **password** in the Password field.
   - Click the **Login** button.

   The User Name and Password are case sensitive.
4. Click the **Login** button.

Figure 2. WebPAM PROe log-in screen



After sign-in, the WebPAM PROe opening screen appears. If there are any unconfigured physical drives in the enclosure, an Array Configuration menu will also appear (see page 44).

Note

Make a Bookmark (Netscape Navigator) or set a Favorite (Internet Explorer) of the Login Screen so you can access it easily next time.

Selecting a Language

WebPAM PROe displays in English, German, French, Italian, Japanese, Chinese Traditional, Chinese Simple, and Korean.

1. Click **Language** on the WebPAM PROe Header.

   The language list appears in the Header.

2. Click on the language you prefer.

   The WebPAM PROe user interface displays in the selected language.

Figure 3. Clicking "Language" on the WebPAM PROe Header

Creating a Disk Array

On a newly activated VTrak subsystem, there are no disk arrays or logical drives. To create a disk array:

1. Click on the Disk Arrays icon, then click on the Create tab.

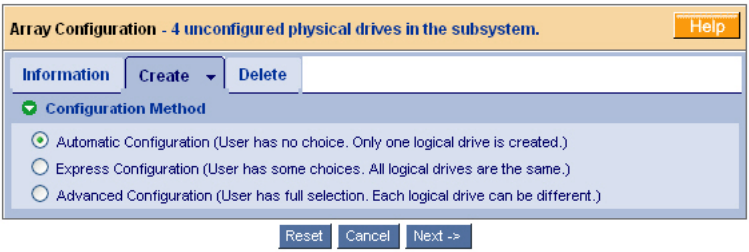
   The Array Configuration menu appears. See Figure 4.

2. Choose one of the options:

   - **Automatic** – Creates a new disk array based on a default set of parameters, including one logical drive. The number of unconfigured physical drives available determines the RAID level of the disk array and whether a spare drive is created. See page 45.
   - **Express** – Creates a new disk array based on the characteristics you specify. You can create multiple logical drives. However, all of the logical drives will be the same size and RAID level. See page 46.
   - **Advanced** – Enables you to directly specify all parameters for a new disk array and its logical drives. See page 47.

3. Click the **Next** button.

Figure 4. The Array Configuration menu


Array Configuration - 4 unconfigured physical drives in the subsystem.
Help
Information
Create
Delete
Configuration Method
Automatic Configuration (User has no choice. Only one logical drive is created.)
Express Configuration (User has some choices. All logical drives are the same.)
Advanced Configuration (User has full selection. Each logical drive can be different.)
Reset
Cancel
Next ->

Automatic

When you choose the Automatic option, the following parameters appear on the screen:

- **Disk Arrays** – The number of physical drives in the disk array, their ID numbers, configurable capacity, and the number of logical drives to be created
- **Logical Drives** – The ID number of the logical drive(s), their RAID level, capacity, and stripe size
- **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available

If you accept these parameters, click the **Submit** button.

The new disk array appears in the Disk Array List on the Information tab.

If you do NOT accept these parameters, use the Express (page 46) or Advanced (page 47) option to create your disk array.

Express

When you choose the Express option, a set of characteristics and options appears on the screen.

1. Check the boxes to select any one or a combination of:
   - **Redundancy** – The array will remain available if a physical drive fails
   - **Capacity** – The greatest possible amount of data capacity
   - **Performance** – The highest possible read/write speed
   - **Spare Drive** – A hot spare drive is created when you select Redundancy, Spare Drive, and five or more unconfigured physical drives are available
2. In the Number of Logical Drives field, enter the number of logical drives you want to make from this disk array.

   The maximum possible number of logical drives appears to the right of this field.
3. From the Application Type menu, select an application that best describes your intended use for this disk array:
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
4. Click the **Update** button.

   Or check the Automatic Update box and updates will occur automatically.

   The following parameters display:
   - **Disk Arrays** – The number of physical drives in the disk array, their ID numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The ID number of the logical drive(s), their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive ID number of the dedicated hot spare assigned to this disk array (all RAID levels except RAID 0)

   If you accept these parameters, proceed to the next step.

   If you do NOT accept these parameters, review and modify your selections in the previous steps.
5. When you are done, click the **Submit** button.

   The new disk array appears in the Disk Array List on the Information tab.

Advanced

Note

For an explanation of the parameters under the Advanced option, see “Chapter 7: Technology Background” on page 231.

When you choose the Advanced option, the *Step 1 – Disk Array Creation* screen displays.

Step 1 – Disk Array Creation

1. Enter a name for the disk array in the field provided.
2. Check the box if you want to enable Media Patrol.

   For more information, see “Media Patrol” on page 255.
3. Check the box if you want to enable PDM.

   For more information, see “Predictive Data Migration (PDM)” on page 256.
4. Highlight physical drives you want in the disk array from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click them to move them.
5. When you are done, click the **Next** button.

Step 2 – Logical Drive Creation

Logical Drive Creation enables you to specify logical drives under the new disk array. Enter the information for a logical drive, then click the **Update** button. If there is free capacity remaining, you can specify another logical drive now or wait until later.

6. Enter an alias for the logical drive in the field provided.
7. Choose a RAID level for the logical drive from the dropdown menu.

   The choice of RAID levels depends the number of physical drives you selected.
8. RAID 50 and 60 only – Specify the number of axles for your array.

   For more information on axles, see “RAID 50 Axles” on page 238 or “RAID 60 Axles” on page 240.
9. Specify a Capacity and the unit of measure (MB, GB, TB).

   This value will be the data capacity of the first logical drive in your new disk array. If you specify less than disk array's maximum capacity, the remainder will be available for additional logical drives which you can create later.
10. Specify a Stripe size from the dropdown menu.

    64 KB, 128 KB, 256 KB, and 1 MB are available. 64 KB is the default.
11. Specify a Sector size from the dropdown menu.

512 B, 1 KB, 2 KB, and 4 KB are available. 512 B is the default.

12. Specify a Read (cache) Policy from the dropdown menu.

    Read Cache, Read Ahead Cache, and No Cache are available. Read Ahead is the default.

13. Specify a Write (cache) Policy from the dropdown menu.

    Write Back and Write Through (Thru) are available. Write Back is the default.

14. From the Preferred Controller ID dropdown menu, select a controller.

    The choices are Controller 1 or 2, or Automatic. This feature is only available on subsystems with two controllers and LUN Affinity enabled.

15. Click the **Update** button.

    A new logical drive is displayed under New Logical Drives.

    Repeat the above steps to specify additional logical drives as desired.

16. When you are done specifying logical drives, click the **Next** button.

Step 3 – Summary

The Summary lists the disk array and logical drive information you specified.

17. To proceed with disk array and logical drive creation, click the **Submit** button.

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

- Close your browser window
- Click **Logout** on the WebPAM PROe banner

Figure 5. Clicking "Logout" on the WebPAM PROe banner

Clicking **Logout** brings you back to the Login Screen. See page 43.

After logging out, you must enter your user name and password in order to log in again.

Using WebPAM PROe over the Internet

The above instructions cover connections between VTrak and your company network. It is also possible to connect to a VTrak from the Internet.

Your MIS Administrator can tell you how to access your network from outside the firewall. Once you are logged onto the network, you can access the VTrak using its IP address.

While only a Fibre Channel or SAS-capable PC can read and write data to the logical drives on the VTrak, other PCs can monitor the VTrak from virtually any location.

Obtaining a Security Certificate

Promise Technology provides a default security certificate for the web server as well as for internal data communication. However, in most cases it is better to install and verify your own certificate. And, if possible, verify your certificate through a certificate authority, such as Verisign or Thwate. See your MIS Administrator for guidance.

To download your security certificate to WebPAM PROe, see “Making Web Server Settings” on page 91.

Chapter 4: Management with WebPAM PROe

This chapter covers the following topics:

- Logging into WebPAM PROe (page 52)
- Selecting a Language (page 54)
- Perusing the Interface (page 55)
- Logging out of WebPAM PROe (page 59)
- Working with the Storage Network (page 60)
- Working with Subsystems (page 61)
- Managing Users (page 72)
- Managing the Network Connection (page 77)
- Managing Fibre Channel Connections (page 79)
- Managing SAS Connections (page 84)
- Managing Storage Services (page 87)
- Managing Software Services (page 90)
- Exporting the User Database (page 98)
- Importing a User Database (page 99)
- Updating the Firmware (page 100)
- Restoring Factory Defaults (page 101)
- Clearing Statistics (page 102)
- Shutting Down the Subsystem (page 103)
- Restarting the Subsystem (page 104)
- Managing Controllers (page 105)
- Managing Enclosures (page 110)
- Managing Physical Drives (page 116)
- Managing Disk Arrays (page 121)
- Managing Logical Drives (page 134)
- Managing Spare Drives (page 141)
- Working with the Logical Drive Summary (page 145)

For information about VTrak's audible alarm and LEDs, see "Chapter 8: Troubleshooting" on page 261.

Logging into WebPAM PROe

In order to log into WebPAM PROe, you must first setup a network connection between your Host PC and the VTrak subsystem, as described in “Chapter 3: VTrak Setup” on page 35.

To log into WebPAM PROe:

1. Launch your Browser.
2. In the Browser address field, type in the IP address of the VTrak Management port.

   Note that the IIP address shown below is only an example. The IP address you type into your browser will be different.

Regular Connection

- WebPAM PROe uses an HTTP connection. . . . . .http://
- Enter the VTrak’s Management Port IP address 192.168.10.85

Together, your entry looks like this:

http://192.168.10.85

Secure Connection

- WebPAM PROe uses a secure HTTP connection. . . . . .https://
- Enter the VTrak’s Management Port IP address 192.168.10.85

Together, your entry looks like this:

https://192.168.10.85

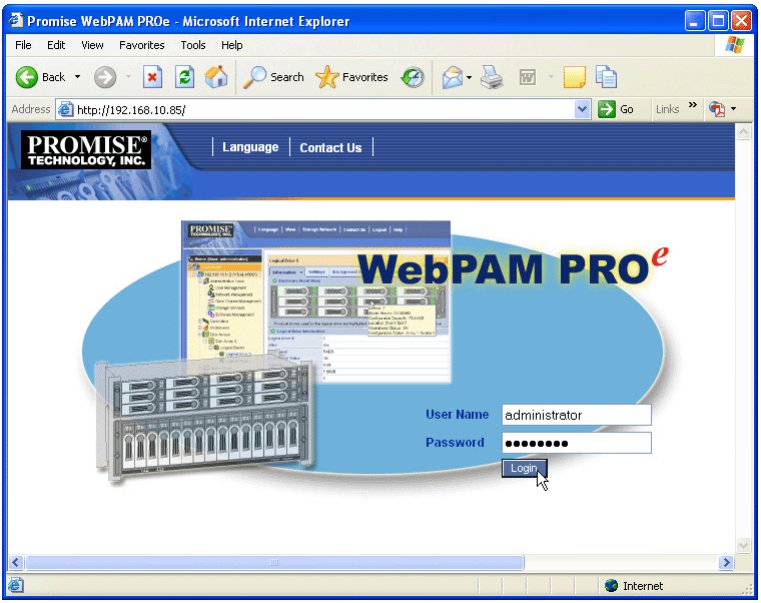
Note

Whether you select a regular or a secure connection, your login to WebPAM PROe and your user password are always secure.

3. When the log-in screen (Figure 1) appears:
   - Type **administrator** in the User Name field.
   - Type **password** in the Password field.
   - Click the **Login** button.

   The User Name and Password are case sensitive.
4. Click the **Login** button.

Figure 1. The WebPAM PROe log-in screen



Selecting a Language

WebPAM PROe displays in English, German, French, Italian, Japanese, Chinese Traditional, Chinese Simple, and Korean.

1. Click **Language** the WebPAM PROe Header.

   The language list appears in the Header.

2. Click the language you prefer.

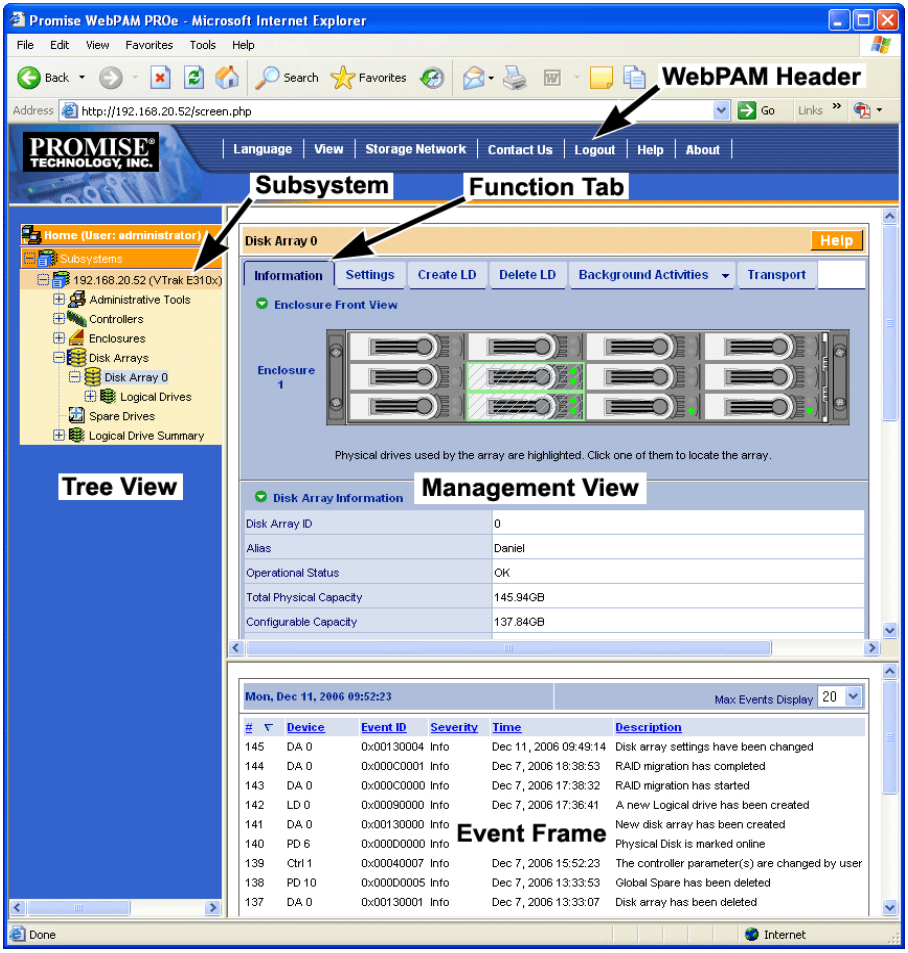
   The WebPAM PROe user interface displays in the selected language.

Figure 2. Clicking "Language" in the Header

Perusing the Interface

WebPAM PROe is browser-based RAID management software with a graphic user interface.

Figure 3. WebPAM PROe interface


Promise WebPAM PROe - Microsoft Internet Explorer
WebPAM Header
Language
View
Storage Network
Contact Us
Logout
Help
About
Subsystem
Function Tab
Home (User: administrator)
Subsystems
192.168.20.52 (VTrak E310x)
Administrative Tools
Controllers
Enclosures
Disk Arrays
Disk Array 0
Logical Drives
Spare Drives
Logical Drive Summary
Tree View
Disk Array 0
Help
Information
Settings
Create LD
Delete LD
Background Activities
Transport
Enclosure Front View
Enclosure 1
Physical drives used by the array are highlighted. Click one of them to locate the array.
Disk Array Information
Management View
Disk Array ID 0
Alias Daniel
Operational Status OK
Total Physical Capacity 145.94GB
Configurable Capacity 137.84GB
Mon, Dec 11, 2006 09:52:23
Max Events Display 20
Device Event ID Severity Time Description
145 DA 0 0x00130004 Info Dec 11, 2006 09:49:14 Disk array settings have been changed
144 DA 0 0x000C0001 Info Dec 7, 2006 18:38:53 RAID migration has completed
143 DA 0 0x000C0000 Info Dec 7, 2006 17:38:32 RAID migration has started
142 LD 0 0x00090000 Info Dec 7, 2006 17:36:41 A new Logical drive has been created
141 DA 0 0x00130000 Info New disk array has been created
140 PD 6 0x000D0000 Info Physical Disk is marked online
139 Ctrl 1 0x00040007 Info Dec 7, 2006 15:52:23 The controller parameter(s) are changed by user
138 PD 10 0x000D0005 Info Dec 7, 2006 13:33:53 Global Spare has been deleted
137 DA 0 0x00130001 Info Dec 7, 2006 13:33:07 Disk array has been deleted
Event Frame
Done
Internet

There are four major parts to the graphic user interface:

- Header (see page 56)
- Tree (see page 57)
- Management View (see page 58)
- Event Frame (see page 58)

Using the Header

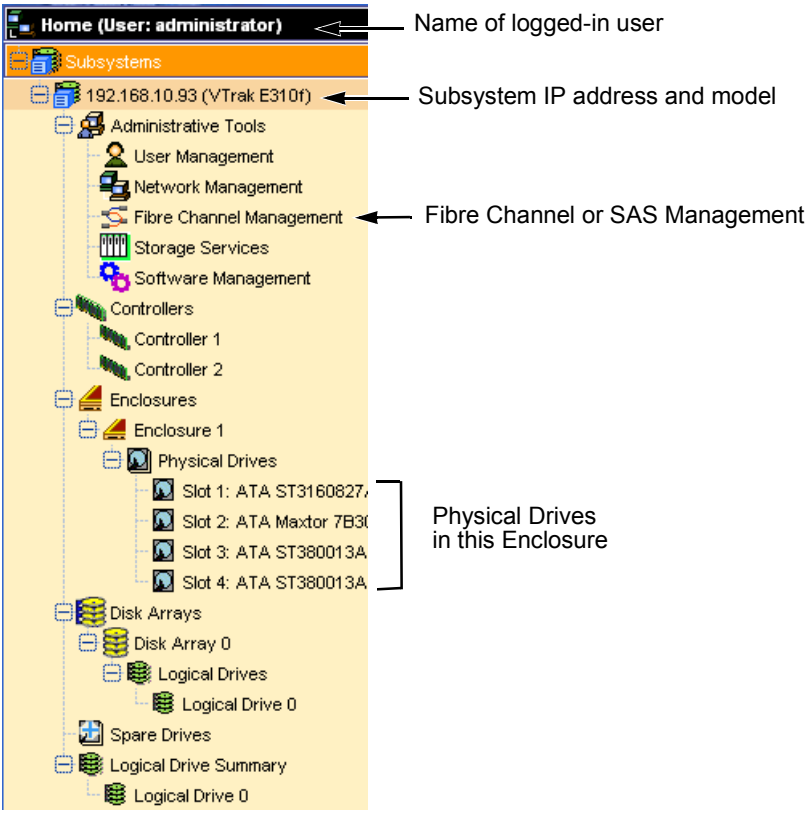
The Header contains the following items:

- **Language** – To change languages, see “Selecting a Language” on page 54.
- **View** – To view the Event Frame, see “Viewing the Event Frame” on page 58.
- **Storage Network** – To view all of the VTrak subsystem enclosures currently accessible the network, see “Working with the Storage Network” on page 60.
- **Contact Us** – Click on **Contact Us** for a list of contact information, including Technical Support. Also see “Contacting Technical Support” on page 305.
- **Logout** – To logout of WebPAM PROe, see “Logging out of WebPAM PROe” on page 59
- **Help** – Click on **Help** in the Header to access the main online help menu.
- **About** – Click on About in the Header to display the WebPAM PROe software version and build date.

Using Tree View

Tree View enables you to navigate around all components of the Subsystem, including Fibre Channel or SAS management, network and service management, RAID controller, enclosure, physical drives, disk arrays, logical drives, and spare drives. The figure below shows the components of Tree View.

Figure 4. WebPAM PROe Tree View



The Administrative Tools section is different for the Super User than for other users. The remainder of the Tree is the same for all users.

Management View displays information according to the item you select in Tree View.

Using Management View

Management View provides the actual user interface with the VTrak, including creation, maintenance, deletion, and monitoring of disk arrays and logical drives.

Function Tabs control specific actions and processes. This window changes depending on which item you select in Tree View and which tab you select in Management View itself.

Click the **Help** button in Management View to access online help for the function that is currently displayed.

Viewing the Event Frame

To view the Event Frame:

1. Click on **View** in the Header.
2. Click the *Show Event Frame* popup option.

   The VTrak user interface will display the Event Frame below Management View.
3. Click **View** again to hide the Event Frame.

In the event frame, events are listed and sorted by:

- **Item Number** – A consecutive decimal number assigned to a specific event
- **Device** – Battery, controller, logical drive, physical drive, port, etc.
- **Event ID** – The hexadecimal number that identifies the specific type of event
- **Severity** – Information, Warning, Minor, Major, Critical, and Fatal. The severity level is user-specified. See “Setting-up User Event Subscriptions” on page 73.
- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

Sorting Events

You can sort the events by Item Number, Device, Event ID, Severity, Time and Date, or Description.

Click on the link at the top of the column by which you want to sort the events. After you click on the item, a triangle icon appears.

- If the triangle points upward, the column is sorted low-to-high or old-to-new.
- If the triangle points downward, the column is sorted high-to-low or new-to-old.

Click the link a second time to change to flip the triangle and reverse the sort sequence.

Logging out of WebPAM PROe

There are two ways to log out of WebPAM PROe:

- Close your browser window
- Click Logout the WebPAM PROe banner (below

Figure 8. Clicking "Logout" in the Header)

Clicking **Logout** brings you back to the Login Screen. After logging out, you must enter your user name and password in order to log in again.

Working with the Storage Network

When you log into WebPAM PROe, you access a specific VTrak subsystem. See “Logging into WebPAM PROe” on page 52.

The Storage Network feature enables you to access all of the VTrak subsytems with a Management Port connection to your network.

Each VTrak subsystem is identified by its Management Port IP address.

Storage Network functions include:

- Viewing other subsystems
- Updating the list of subsystems
- Logging into a subsystem
- Hiding the other subsystems

Viewing Other Subsytems

To view the other VTrak subsytems the Storage Network:

1. Click on **Storage Network** in the Header.
2. Click the *Show Network Subsystems* popup option.

   The list will show all subsystems the network at the time the GUI was launched.

Updating the List of Subsystems

To update the list of the VTrak subsytems the Storage Network:

Click the **Discover** button at the bottom of the subsystem list.

Logging into a Subsystem

To log into any of the displayed VTrak subsystems:

1. In Tree View, click the Subsystem icon of the subsystem you want to see.

   If your user name and password do not match the subsystem you are logging into, the log in screen will appear.
2. Log into the new subsystem, as needed.

Hiding the Other Subsystems

To hide the other VTrak subsystems the Storage Network:

1. Click on **Storage Network** in the Header.
2. Click the *Hide Network Subsystems* popup option.

Working with Subsystems

A VTrak subsystem is identified by its Management Port IP address. Subsystem functions include:

- Viewing Subsystem Information (page 61)
- Saving Subsystem Configuration (page 62)
- Setting an Alias for the Subsystem (page 62)
- Setting Redundancy for the Subsystem (page 62)
- Setting Cache Mirroring for the Subsystem (page 62)
- Setting Subsystem Date and Time (page 63)
- Viewing the Runtime Event Log (page 63)
- Saving the Runtime Event Log (page 64)
- Clearing the Runtime Event Log (page 64)
- Viewing NVRAM Events (page 65)
- Saving NVRAM Events (page 65)
- Clearing NVRAM Events (page 66)
- Viewing Current Background Activities (page 66)
- Making Background Activity Settings (page 66)
- Running Background Activities (page 67)
- Running Media Patrol (page 68)
- Running PDM (page 68)
- Viewing Scheduled Activities (page 68)
- Scheduling an Activity (page 69)
- Deleting a Scheduled Activity (page 70)
- Viewing Lock Status (page 70)
- Setting the Lock (page 70)
- Renewing the Lock (page 71)
- Releasing the Lock (page 71)

Viewing Subsystem Information

To view information about a subsystem, click the Subsystem icon in Tree View. Management View displays the subsystem information.

Saving Subsystem Configuration

To save the subsystem's configuration and status information to text file on your Host PC:

1. In Tree View, click the Subsystem icon.
2. On the Information tab, click the **Save** button.
3. Direct your browser where to save the configuration and status file.

Setting an Alias for the Subsystem

An alias is optional. To set an alias for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Settings tab.
3. Enter a name into the Alias field.

   Maximum of 48 characters. Use letters, numbers, space between words, and underscore.
4. Click the **Submit** button.

Setting Redundancy for the Subsystem

To set redundancy for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Settings tab.
3. In the Redundancy Type dropdown menu, select:
   - Active-Active – Both RAID controllers are active and can share the load
   - Active-Standby – One RAID controller is in standby mode and goes active if the other fails
4. Click the **Submit** button.

If you change Redundancy Type, be sure both controllers are properly installed in the subsystem before you restart.

If your subsystem has dual controllers and they are set to Active-Active, you can use the LUN Affinity feature. See “Making Controller Settings” on page 107.

Setting Cache Mirroring for the Subsystem

This option applies only to subsystems with two controllers. To use Cache Mirroring, the Redundancy Type must be set to Active-Active.

To change Cache Mirroring for this subsystem:

1. In Tree View, click the Subsystem icon.

2. In Management View, click the Settings tab.
3. Do one of the following actions:
   - To enable Cache Mirroring, check the Cache Mirroring box.
   - To disable Cache Mirroring, uncheck the Cache Mirroring box.
4. Click the **Submit** button.
5. Restart the subsystem.

   See “Restarting the Subsystem” on page 104.

Notes

- If you disable Cache Mirroring, LUN Affinity will be enabled automatically.
- If you change Cache Mirroring, be sure both controllers are properly installed in the subsystem before you restart.

Setting Subsystem Date and Time

To set a Date and Time for this subsystem:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Settings tab dropdown menu and select *Date and Time* Settings.
3. Under Subsystem Date, select the Month and Day from the dropdown menus.
4. Type the current year into the Year field.
5. Under Subsystem Time, select the Hour, Minutes and Seconds from the dropdown menus.
6. Click the **Submit** button.

Viewing the Runtime Event Log

Runtime Events lists information about the 1023 most recent runtime events recorded since the system was started. To view runtime events:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Events tab dropdown menu and select *Runtime Events*.

   Events are displayed by:
   - **Item Number** – A consecutive decimal number assigned to a specific event
   - **Device** – Battery, controller, logical drive, physical drive, port, etc.

- **Event ID** – The hexadecimal number that identifies the specific type of event
- **Severity** – Information, Warning, Minor, Major, Critical, and Fatal. The severity level is user-specified. See “Setting-up User Event Subscriptions” on page 73.
- **Time** – Time and date of the occurrence
- **Description** – A brief description of the event

3. Click on the link at the top of the column by which you want to sort the events. After you click on the item, a triangle icon appears.
   - If the triangle points upward, the column is sorted low-to-high or old-to-new.
   - If the triangle points downward, the column is sorted high-to-low or new-to-old.

   Click the link a second time to change to flip the triangle and reverse the sort sequence.

Saving the Runtime Event Log

To save the runtime event log as a text file:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Events tab dropdown menu and select *Runtime Events*.
3. Click the **Save Event Log** button.
4. In the File Download dialog box, click the **Save** button.
5. In the Save dialog box, name the file, navigate to the folder where you want to save the log file, and click the **Save** button.

Clearing the Runtime Event Log

To clear the runtime event log:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Events tab dropdown menu and select *Runtime Events*.
3. Click the **Clear Event Log** button.
4. In the Confirmation dialog box, type **confirm** and click the **OK** button.

Viewing NVRAM Events

NVRAM Events lists information about the 63 most recent important events. NVRAM events are stored in non-volatile memory. To view runtime events:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Events tab dropdown menu and select *System Events in NVRAM*.

   Events are displayed by:

   - **Item Number** – A consecutive decimal number assigned to a specific event
   - **Device** – Battery, controller, logical drive, physical drive, port, etc.
   - **Event ID** – The hexadecimal number that identifies the specific type of event
   - **Severity** – Information, Warning, Minor, Major, Critical, and Fatal. The severity level is user-specified. See “Setting-up User Event Subscriptions” on page 73.
   - **Time** – Time and date of the occurrence
   - **Description** – A brief description of the event
3. Click on the link at the top of the column by which you want to sort the events. After you click on the item, a triangle icon appears.
   - If the triangle points upward, the column is sorted low-to-high or old-to-new.
   - If the triangle points downward, the column is sorted high-to-low or new-to-old.

   Click the link a second time to change to flip the triangle and reverse the sort sequence.

Saving NVRAM Events

To save the NVRAM event log as a text file:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Events tab dropdown menu and select *System Events in NVRAM*.
3. Click the **Save Event Log** button.
4. In the File Download dialog box, click the **Save** button.
5. In the Save dialog box, name the file, navigate to the folder where you want to save the log file, and click the **Save** button.

Clearing NVRAM Events

To clear the NVRAM event log:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Events tab dropdown menu and select *System Events in NVRAM*.
3. Click the **Clear Event Log** button.
4. In the Confirmation dialog box, type **confirm** and click the **OK** button.

Viewing Current Background Activities

To view the current background activities:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Background Activities tab.

   A list of current background activities appears, including:

   - Rebuild
   - PDM – Predictive Data Migration
   - Synchronization
   - Redundancy Check
   - Migration
   - Transition
   - Initialization
   - Media Patrol

Making Background Activity Settings

To make settings for background activities:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Background Activities tab and select *Settings* from the dropdown menu.
3. Click the dropdown menu to choose a priority of *Low*, *Medium*, and *High* for the following functions:

   - Rebuild – Rebuilds the data from a failed drive in a disk array
   - Synchronization – Checks the data integrity on disk arrays
   - Initialization – Sets all data bits in the logical drive to zero
   - Redundancy Check – Checks, reports and can correct data inconsistencies in logical drives
   - Migration – Change RAID level or add physical dries to disk arrays

- PDM – Looks for bad blocks the physical drives of disk arrays
- Transition – Returns a revertible spare drive to spare status

The rates are defined as follows:

- Low – Fewer resources to activity, more to data read/write.
- Medium – Balance of resources to activity and data read/write.
- High – More resources to activity, fewer to data read/write.

4. Highlight the following PDM trigger settings and type a value into the corresponding field:
   - Reassigned Block Threshold – 1 to 512 blocks
   - Error Block Threshold – 1 to 1024 blocks
5. Check to enable or uncheck to disable the following functions:
   - Media Patrol – Checks the magnetic media on physical drives
   - Auto Rebuild – If there is a spare drive of adequate capacity, a critical disk array will begin to rebuild automatically. If not spare drive is available, the disk array will begin to rebuild as soon as you replace the failed physical drive with an unconfigured physical drive of equal or greater size.
6. Click the **Submit** button to save your settings.

Running Background Activities

To run a background activity from the Background Activities tab:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Background Activities tab and select one of the following from the dropdown menu.
   - Media Patrol – See “Running Media Patrol” on page 68
   - Rebuild – See “Rebuilding a Disk Array” on page 130
   - PDM – See “Running PDM” on page 68
   - Transition – See “Transitioning a Disk Array” on page 132
   - Initialization – See “Initializing a Logical Drive” on page 137
   - Redundancy Check – See “Running Redundancy Check” on page 137
3. In the next screen, make the choices as requested.
4. Click the **Start** button.

Running Media Patrol

Media Patrol checks the magnetic media on physical drives. When it finds the specified number of bad blocks, it will trigger PDM. See “Making Background Activity Settings” on page 66 and “Running PDM” on page 68.

You can schedule Media Patrol to run automatically, see “Scheduling an Activity” on page 69.

To run Media Patrol:

1. In Tree View, click the Subsystem icon.
2. From the dropdown menu on the Background Activities tab, select *Start Media Patrol*.
3. In the next screen, click the **Start** button.

Running PDM

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare disk drive, similar to Rebuilding. But unlike Rebuilding, PDM acts *before* the disk drive fails and your Logical Drive goes Critical.

You an also run PDM on a specific disk array, see “Running PDM on a Disk Array” on page 131.

Also see “Predictive Data Migration (PDM)” on page 256.

To run PDM:

1. In Tree View, click the Subsystem icon.
2. In Management View, click the Background Activities tab and select *Start Media Patrol* from the dropdown menu.
3. In the next screen, select the Source and Target physical drives.

   The suspect physical drive is the source. The replacement physical drive is the target.
4. Click the **Start** button.

Viewing Scheduled Activities

To view scheduled activities for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the Scheduler tab in Management View.

Scheduling an Activity

To set a scheduled activity for this subsystem:

1. Click the Subsystem icon Tree View.
2. From the dropdown menu on the Scheduler tab, choose an item:
   - Media Patrol. See “Running Media Patrol” on page 68
   - Redundancy Check. See “Running Redundancy Check” on page 137
   - Battery Reconditioning. See “Reconditioning a Battery” on page 114
   - Spare Drive Check. See “Running Spare Check” on page 144
3. In the Scheduler dialog box, check the Enable This Schedule box.
4. Select a start time (24-hour clock).
5. Select a Recurrence Pattern.
   - Daily – Enter the number of days between events.
   - Weekly – Enter the number of weeks between events and select which days of the week.
   - Monthly – Select a calendar day of the month (1 – 31).

   If you select a higher number than there are days in the current month, the actual start date will occur at the beginning of the following month.

   Or, select a day of the week and select the first, second, third, fourth, or last occurrence of that day in the month.

   Then, select the months in which you want the activity to occur.
6. Select a Range of Occurrence.
   - Start-from date. The default is today's date.
   - End-on date.

   Select No End Date (perpetual).

   Or, select a number of occurrences for this activity.

   Or, select a specific end date. The default is today's date.
7. For Redundancy Check only:
   - Choose the Auto Fix option. This feature attempts to repair the problem when it finds an error.
   - Choose the Pause on Error option. This feature stops the process when it finds an error
   - Check the boxes beside the logical drives (all except RAID 0) to which this activity will apply.

     Each logical drive can have only one scheduled Redundancy Check.

Note

You can schedule only ONE Redundancy Check for each logical drive.

8. Click the **Submit** button.

Deleting a Scheduled Activity

To delete a scheduled activity for this subsystem:

1. Click the Subsystem icon Tree View.
2. From the dropdown menu on the Scheduler tab, choose *Delete Schedules*.
3. Check the box to the left of the schedule you want to delete.
4. Click the **Submit** button.

Viewing Lock Status

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

To view the lock status for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the Lock tab in Management View.

   The following information is displayed:

   - Lock Status – The User who set (owns) the current lock.
   - Expiration Time – Amount of time left until the lock automatically releases.
   - Expire At Time – The date and time when the lock will automatically release.

Setting the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

You can set the lock to last from one minute to one day. To set the lock for this subsystem:

1. Click the Subsystem icon Tree View.

2. Click the Lock tab in Management View.
3. Click the **Lock** option.
4. Enter a time interval between 1 and 1440 minutes (one day) that you want the lock to stay active.
5. Click the **Submit** button.

Renewing the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

Renewing the lock extends the period of time the controller remains locked. To renew an existing lock for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the Lock tab in Management View.
3. Click the **Renew** option.
4. Enter a time interval between 1 and 1440 minutes (one day) that you want the lock to stay active.

   The renew time replaces the previous Expiration Time.
5. Click the **Submit** button.

Releasing the Lock

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done.

When the user who locked the controller logs out, the lock is automatically released. You can also release the lock before the scheduled time.

To release the lock for this subsystem:

1. Click the Subsystem icon Tree View.
2. Click the Lock tab in Management View.

   If you are the User who set the lock, click the **Unlock** option.

   If another User set the lock and you are a Super User, click the **Unlock** option and check the **Force Unlock** box.
3. Click the **Submit** button.

Managing Users

User Management includes all functions dealing with user accounts. Functions include:

- Viewing User Information (page 72)
- Making User Settings (page 72)
- Making Your Own User Settings (page 73)
- Setting-up User Event Subscriptions (page 73)
- Changing Another User's Password (page 74)
- Changing Your Own Password (page 74)
- Creating a User (page 75)
- Deleting a User (page 76)
- Viewing User Sessions (page 76)
- Logging out Other Users (page 76)

Viewing User Information

The view a list of users, their status, access privileges, display name, and email address:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.

   The Information tab appears in Management View.

Making User Settings

To change settings of other users:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. On the Information tab, click the link of the user whose settings you want to change.

   The Settings screen for the selected user displays.
6. Make the following settings as needed.
   - Check the Enable box to enable this user.
   - Uncheck the box to disable this user.
   - Enter or change the display name.

- Enter or change the email address.
- From the Privilege dropdown menu, choose a new level.

  See “List of User Privileges” on page 75

7. Click the **Submit** button.

The Administrator or Super User can change another user’s password. See “Changing Another User’s Password” on page 74 for more information.

Making Your Own User Settings

To change your own user settings:

1. Log into WebPAM PROe under your own user name.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the Settings tab in Management View.
6. Enter or change the display name or mail address.
7. Click the **Submit** button.

Setting-up User Event Subscriptions

An event subscription enables a user to receive email messages about events taking place in the VTrak subsystem. To make or change user event subscriptions:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.
4. Click the Event Subscription tab in Management View.
5. Check the box to enable event notification.
6. Under the subheadings, select the lowest level of Severity to be reported for each event. The selected level plus all higher levels of Severity will be reported.
   - Information – Information only, no action is required
   - Warning – User can decide whether or not action is required
   - Minor – Action is needed but the condition is not a serious at this time
   - Major – Action is needed now
   - Critical – Action is needed now and the implications of the condition are serious

- Fatal – Non-Recoverable error or failure has occurred
- None – Deactivates this event for notification purposes

7. Click the **Submit** button.

The user's account must have an email address. See "Making User Settings" on page 72.

For information about the email service, see "Making Email Settings" on page 90.

To send a test message to the email address in the listed under General Info, click the **Test Email** button.

Changing Another User's Password

To change a user's password:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. In the list of users, click the link of the user whose settings you want to change.

   The Settings screen for the selected user displays.
6. Click the Password tab in Management View.
7. Enter the new password in the New Password field.
8. Enter the new password in the Retype Password field.
9. Click the **Submit** button.

Changing Your Own Password

To set or change your own password:

1. Log into WebPAM PROe under your own user name.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the Password tab in Management View.
6. Enter the current password in the Old Password field.

   If you do not have a password, leave this field blank.
7. Enter the new password in the New Password field.
8. Enter the new password in the Retype Password field.

9. Click the **Submit** button.

Creating a User

To create a user:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the Create tab in Management View.
6. Enter a user name in the User Name field.
7. Enter a password for this user in the New Password and Retype Password fields.

   A password is optional. If you do not specify a password, log into WebPAM PROe with the User Name and leave the password field blank.
8. Enter a display name in the Display Name field.

   A display name is optional.
9. Enter the user's email address in the Email Address field.

   An email address is required in order to receive email event notification.
10. Select a privilege level from the Privilege dropdown menu.

    For definitions of each privilege level, see the List of User Privileges below.
11. Check the Enabled box to enable this user on this subsystem.
12. Click the **Submit** button.

List of User Privileges

- **View** – Allows the user to see all status and settings but not to make any changes
- **Maintenance** – Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
- **Power** – Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller.
- **Super** – Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User.

Deleting a User

There will always be at least one Super User account. You cannot delete the user account you used to log in.

To delete a user:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the Delete tab in Management View.
6. Check the box to the left of the user you want to delete.
7. Click the **Submit** button.
8. Click **OK** in the confirmation box.

Viewing User Sessions

To view the current sessions:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the User Management icon.
4. Click the Sessions tab in Management View.

Logging out Other Users

To logout other users:

1. Log into WebPAM PROe as the Administrator or a Super User.
2. Click the Subsystem icon in Tree View.
3. Click the Administrative Tools icon.
4. Click the User Management icon.
5. Click the Sessions tab in Management View.
6. Check the box to the left of the user you want to log out.
7. Click the **Logout** button.
8. Click **OK** in the confirmation box.

Managing the Network Connection

The network connection deals with network connections to the VTrak's Management Ports. Functions include:

- Making Subsystem Management Port Settings (page 77)
- Making Controller Management Port Settings (page 77)

Making Subsystem Management Port Settings

The VTrak subsystem has a virtual management port. When you log into the VTrak over your network, you use the virtual management port. This arrangement enables you to log into a VTrak with two controllers using one IP address.

Before you change settings, please see "Choosing DHCP or a Static IP Address" on page 36.

To make changes to the Subsystem Management Port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Network Management icon.
4. Click the **Port Configuration** link in Management View.
5. To enable DHCP, check the DHCP box.

   When DHCP is NOT enabled, enter:

   - Primary IP address
   - Primary subnet mask
   - Default gateway IP address
   - Enter a primary DNS server IP address.
6. Click the **Submit** button.

Making Controller Management Port Settings

The controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See "Controller Enters Maintenance Mode" on page 298 for more information.

To make changes to the Controller Management Port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Network Management icon.

4. Click the Maintenance Mode tab in Management View.
5. Click the **Port Configuration** link for Controller 1 or 2.
6. To enable DHCP, check the DHCP box.

   When DHCP is NOT enabled, enter:
   - Primary IP address
   - Primary subnet mask
   - Default gateway IP address
   - Enter a primary DNS server IP address.
7. Click the **Submit** button.
8. Click the Maintenance Mode tab again.
9. Click the **Port Configuration** link for the other controller.
10. To enable DHCP, check the DHCP box.

    When DHCP is NOT enabled, enter:
    - Primary IP address
    - Primary subnet mask
    - Default gateway IP address
    - Enter a primary DNS server IP address.
11. Click the **Submit** button.

Managing Fibre Channel Connections

This feature pertains to VTrak Fibre Channel models. Functions include:

- Viewing Fibre Channel Node Information (page 79)
- Viewing Fibre Channel Port Settings (page 79)
- Making Fibre Channel Port Settings (page 80)
- Viewing Fibre Channel Port Statistics (page 81)
- Viewing SFP Information (page 81)
- Viewing Fibre Channel Logged-in Devices (page 82)
- Viewing Fibre Channel Initiators (page 82)

Viewing Fibre Channel Node Information

To view Fibre Channel node information:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the Node tab in Management View.

   The current node (data port) settings the Controller are shown, including:

   - WWNN – World Wide Node Name
   - Supported Features – Class of service
   - Maximum Frame Size – 2048 bits
   - Supported Speeds – 4 Gb/s, 2Gb/s, or 1 Gb/s

Viewing Fibre Channel Port Settings

To view the current Fibre Channel port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the Port tab in Management View

   The current data port settings the Controller are shown, including:

   - State – Online, Offline, Unknown
   - Port Identifier – A hexadecimal name for this port
   - Topology Attached – See the table on page 81
   - Fabric WWNN – World Wide Node Name (appears when connected to a switch)

- Fabric WWPN – World Wide Port Name (appears when connected to a switch)
- Current Speed – 4 Gb/s, 2 Gb/s, or 1 Gb/s
- Link Type – Long-wave laser, short-wave laser or electrical
- Symbolic Name – A text name for this port
- Link Speed* – 4 Gb/s, 2 Gb/s, 1 Gb/s, or Auto
- Topology* – NL-Port, N-Port, or Auto
- Hard ALPA* – Address can be 0 to 254. 255 means this feature is disabled
- Alias WWPN

* Denotes items that you can change under Port Settings, below.

Making Fibre Channel Port Settings

To make Fibre Channel port settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the Port tab in Management View
5. Click the **Port1** or **Port2** link in Management View.
6. Make the settings appropriate to your system. See “Port Setting Information” on page 81.
   - Configured Link Speed – 4 Gb/s, 2 Gb/s, 1 Gb/s or Auto (self-setting)
   - Configured Topology – N-Port (Point-to-Point), NL Port (Arbitrated Loop) or Auto (self-setting)
   - Hard ALPA – Address can be 0 to 254. 255 means this feature is disabled. An ALPA identifies a port in an arbitrated loop.
7. Click the **Submit** button to save your settings.

Port Setting Information

The table below shows the type of attached topology you will achieve based on your connection type and the configured topology you select.

Fibre Channel Attached Topology		
	Configured Topology	
Connection Type	N-Port	NL-Port
Switch	Fabric Direct	Public Loop
Direct	Point to Point	Private Loop

Example 1: If you connect the VTrak to a Fibre Channel switch and select NL-Port topology, you will create a Public Loop attached topology.

Example 2: If you have a Point to Point attached topology, you made a direct connection (no switch) and selected N-port topology.

Note

In some cases, HBA settings to N-Port only work if connected to the switch. Refer to your HBA manual for more information.

Viewing Fibre Channel Port Statistics

To view statistics for the Fibre Channel ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the Statistic tab in Management View.

   The statistics for all Fibre Channel ports are shown.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 102.

Viewing SFP Information

SFPs (small form-factor pluggable) transceivers connect the ports the VTrak controllers to the Fibre Channel fabric.

To view SFP information:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the SFP tab in Management View.

   The SFP information for all Fibre Channel ports is shown.

SFP Information

- Connector – Type of connector
- Transceiver – SFP
- Transceiver Code – Defines the method to interpret the transceiver type and compatibility options
- Serial Encoding – Serial encoding algorithm
- Bit Rate – In gigabits per second
- Link Length – The maximum link length depending the type of fiber
- Vendor Name – Vendor name of the SFP transceiver
- Vendor OUI – Organizational Unique Identifier, SFP vendor's IEEE company ID
- Vendor Part Number
- Vendor Revision
- Vendor Serial Number
- Manufacturing Date – Code with 2 digits each for year, month, day, and optional vendor-specific lot number

Viewing Fibre Channel Logged-in Devices

To view a list of the devices currently logged into the VTrak:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the Logged In Device tab in Management View.

   One of the devices in the list will be the port itself. If there is no other device, this notification will appear: "There is no logged in device." If a Fibre Channel switch is attached, it will also appear in this list.

Viewing Fibre Channel Initiators

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN for your logical drive.

To view a list of recognized initiators:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Fibre Channel Management icon.
4. Click the Initiator tab in Management View.

   A Fibre Channel switch will also display as an initiator in the list. If your Host PC's Fibre Channel HBA is connected to the VTrak directly (not though a Fibre Channel switch), the initiator will NOT display in the initiator list.

Adding an Initiator

To add an initiator to the VTrak's initiator list:

1. Check the box to the left of the initiator.
2. Click the **Add to Initiator List** button.

The initiator appears under Storage Services. See page 87. You can then use the initiator to create a LUN. See "Adding a LUN Map" on page 88.

Managing SAS Connections

This feature pertains to VTrak Serial Attached SCSI models. Functions include:

- Viewing SAS Port Information (page 84)
- Making SAS Port Settings (page 84)
- Viewing SAS Port Statistics (page 85)
- Viewing SAS Initiators (page 85)

Viewing SAS Port Information

A SAS Controller can have one or two SAS channels. Each SAS channel has two ports:

- Host In or Data Port (a table-routed port)
- Host In/Out or Data Cascade Port (a subtractive-routed port)

See “Serial Attached SCSI” on page 26 for information about how these ports are physically connected to the Host PC or other subsystems.

To view information about the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.

   The port information appears the screen.
   - Channel ID
   - Port Type
   - Link Status
   - Link Speed
   - SAS Address
   - Cable Signal Strength – Adjustable under Port Settings

See “Serial Attached SCSI” on page 26 for information about how these ports are physically connected to the Host PC or other subsystems.

Making SAS Port Settings

A SAS Controller can have one or two SAS channels. Each SAS channel has two ports:

- Host In or Data Port (a table-routed port)
- Host In/Out or Data Cascade Port (a subtractive-routed port)

To make settings to the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the **Port 1** or **Port 2** link.
5. From the Cable Signal Strength dropdown menu, choose a value.

   The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory (see “Viewing SAS Port Statistics” on page 85), try settings of 1 and 3, then use the best setting for your system.
6. Click the **Submit** button.

Viewing SAS Port Statistics

The SAS Management Statistics tab displays statistical information about all of the SAS ports on the VTrak subsystem.

To view information about the SAS ports:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the Statistic tab.

   The statistics for the selected port appear the screen.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 102.

Viewing SAS Initiators

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN for your logical drive.

To view a list of recognized initiators:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the SAS Management icon.
4. In Management View, click the Initiators tab.

   A list of all currently logged-in initiators appears the screen.

Adding an Initiator

To add an initiator to the VTrak's initiator list:

1. Check the box to the left of the initiator.
2. Click the **Add to Initiator List** button.

The initiator appears under Storage Services. See page 87. You can then use the initiator to create a LUN. See "Adding a LUN Map" on page 88.

Managing Storage Services

Storage services deal with initiators and LUN mapping for Fibre Channel models and for Serial Attached SCSI models. LUN masking is the process of applying a LUN Map so that each initiator can only access the LUNs specified for it.

Features include:

- Adding an Initiator (page 87)
- Deleting an Initiator (page 88)
- Viewing the LUN Map (page 88)
- Enabling LUN Masking (page 88)
- Adding a LUN Map (page 88)
- Editing a LUN Map (page 89)

Adding an Initiator

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN

To add an initiator:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the Initiators tab in Management View.
5. From the Initiators tab dropdown menu, select *Add Initiator*.
6. Enter the initiator's name in the Initiator Name field.
   - Fibre Channel – A Fibre Channel initiator name is the World Wide Port Name of the device and is composed of a series of eight, two-digit hexadecimal numbers.
   - SAS – A SAS initiator name is the SAS address of the HBA card in the Host PC. Obtain the initiator name from the initiator utility on your host system.

   Obtain the initiator name from the initiator utility on your host system.

   Note that the initiator name you input must match exactly in order for the connection to work.
7. Click the **Submit** button.

You can also add initiators from the Fibre Channel or SAS Initiators tab. See “Viewing Fibre Channel Initiators” on page 82 and “Viewing SAS Initiators” on page 85.

Deleting an Initiator

To delete an initiator:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the Initiators tab in Management View.
5. From the Initiators tab dropdown menu, select *Delete Initiators*.
6. Check the box to the left of the initiator you want to delete.
7. Click the **Submit** button.

Viewing the LUN Map

To view the current LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the LUN Map tab in Management View.

Enabling LUN Masking

To enable the LUN Masking:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the LUN Map tab in Management View.
5. Click the LUN Masking Enabled box.
6. Click the **Submit** button.

Adding a LUN Map

To edit the LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the LUN Map tab in Management View and from the dropdown menu, select *Add a LUN Map*.

5. Select an initiator from the Initiator dropdown list.

   Or enter the initiator's name in the Initiator Name field.

   Note that the initiator name you input must match exactly in order for the connection to work.
6. In the LUN Mapping & Masking list, enter the LUNs for each logical drive.

   You must enter different LUN numbers for each logical drive.
7. Click the **Submit** button.

Editing a LUN Map

To edit the LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Storage Services icon.
4. Click the LUN Map tab in Management View.
5. From the LUN Mapping & Masking Information list, select an initiator and click on its link.
6. Select an initiator from the Initiator dropdown list.

   Or enter the initiator's name in the Initiator Name field.

   Note that the initiator name you input must match exactly in order for the connection to work.
7. In the LUN field, enter the LUNs for each logical drive.

   You must enter different LUN numbers for each logical drive.
8. Click the **Submit** button.

Managing Software Services

Software Services include the following functions:

- Making Email Settings (page 90)
- Making SLP Settings (page 91)
- Making Web Server Settings (page 91)
- Making Telnet Settings (page 93)
- Making SNMP Settings (page 93)
- Making CIM Settings (page 95)
- Making Netsend Settings (page 96)

Making Email Settings

The Email sends notification messages to users. See Setting-up User Event Subscriptions (page 73).

To make Email service settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Email Setting** link in Management View.
4. Enter the IP address for your SMTP server.
5. Enter server port number for your SMTP server.

   25 is the default.
6. Select Yes to enable SMTP authentication or No to Yes.
7. If you selected Yes for SMTP authentication, enter a Username and Password in the fields provided.
8. Enter an Email sender address (example: RAIDmaster@mycompany.com).
9. Enter an Email subject (example: VTrak Status).
10. Click the **Submit** button.

Sending a Test Message

To send one test message to the User currently logged into WebPAM PROe:

1. Under Test Email, check the “Send A Test Email” box.
2. Click the **Submit** button.

If you do not receive the Test Email message, see your Network Administrator for assistance with the mail server setup, email accounts, and other issues.

Changing the Startup Setting

1. Under Startup Type:

- Click on the Automatic option to start the service automatically during system startup. Recommended.
- Click on the Manual option to start the service manually (the service does not start during system startup).

2. Click on the **Submit** button.

Stopping Email service

To stop the Email service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Email service

To start or restart the Email service, click the **Start** or **Restart** button.

Making SLP Settings

VTrak's SLP service discovers services available over the Internet. To make SLP service settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click on the Software Management icon.
4. Click the **SLP** link.
5. Choose the Startup Type.
   - Click on the Automatic option to start the service automatically during system startup. Recommended.
   - Click on the Manual option to start the service manually (the service does not start during system startup).
6. Click the **Submit** button.

Stopping SLP service

To stop the SLP service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SLP service

To start or restart the SLP service, click the **Start** or **Restart** button.

Making Web Server Settings

VTrak's Web Server service connects the VTrak GUI to the VTrak subsystem though your browser.

To make Web Server settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Web Server Setting** link in Management View.
4. Enter the HTTP Port number.

   80 is the default.
5. Enter Session Time Out interval.

   This setting causes WebPAM PROe to time-out after a period of inactivity. 24 minutes is the default. The range is 1 to 1440 minutes (one day).
6. If you want to use a secure connection, check the Enable SSL box.
7. If you checked the Enable SSL box, enter a HTTPS Port number.

   443 is the default.
8. If you want to download a SSL Certificate, check the Download Certificate box.
9. If you checked the Download Certificate box, enter the Certificate filename or click the Browse... button to locate it.
10. Click the **Submit** button.
11. Click **OK** in the confirmation box to restart the Web Server service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click on the Automatic option to start the service automatically during system startup. Recommended.
   - Click on the Manual option to start the service manually (the service does not start during system startup).
2. Click on the **Submit** button.

Stopping Web Server service

To stop the Web Server service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Web Server service

To start or restart the Web Server service, click the **Start** or **Restart** button.

Making Telnet Settings

VTrak's Telnet service enables you to access VTrak's Command Line Interface (CLI) through a network connection. To make Telnet settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Telnet Setting** link in Management View.
4. Enter the Telnet Port number.

   2300 is the default.
5. Enter the Maximum Number of Connections.

   4 is the default.
6. Enter the Session Time Out interval.

   24 minutes is the default.
7. Click the **Submit** button.
8. Click **OK** in the confirmation box to restart the Telnet service with your changes.

Changing the Startup Setting

1. Under Startup Type:
   - Click on the Automatic option to start the service automatically during system startup. Recommended.
   - Click on the Manual option to start the service manually (the service does not start during system startup).
2. Click on the **Submit** button.

Stopping Telnet service

To stop the Telnet service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Telnet service

To start or restart the Telnet service, click the **Start** or **Restart** button.

Making SNMP Settings

VTrak's SNMP service enables the SNMP browser to obtain information from the VTrak. The Trap Sink is where SNMP events are sent and can be viewed.

To change the SNMP settings:

1. Click the Subsystem icon in Tree View.

2. Click the Administrative Tools icon.
3. Click the **SNMP Management** link in Management View.
4. Enter the SNMP Port number.

   161 is the default.
5. Enter a System Name.

   There is no default name.
6. Enter a System Location.

   USA is the default.
7. Enter a System Contact (the email address of the administrator or other individual).
8. Enter the Read Community.

   Public is the default.
9. Enter the Write Community.

   Private is the default.

   To add a Trap Sink, see “Adding Trap Sinks” below.
10. Click **OK** in the confirmation box to restart the SNMP service with your changes.

Adding Trap Sinks

To add a trap sink:

1. Enter a Trap Sink IP address.
2. Select a Trap Filter, select the lowest level of Severity to be reported for each event.

   See “Setting-up User Event Subscriptions” on page 73 for an explanation of the Severity levels.
3. Click the **Update** button.

   The new trap sink appears in the Trap Sinks list.
4. Click the **Submit** button.
5. Click **OK** in the confirmation box.

Deleting Trap Sinks

To delete a trap sink:

1. Highlight the trap sink you want to delete from the list.
2. Click the **Delete** button to remove the trap sink from the list.
3. Click the **Submit** button.
4. Click **OK** in the confirmation box.

Changing the Startup Setting

1. Under Startup Type:
   - Click on the Automatic option to start the service automatically during system startup. Recommended.
   - Click on the Manual option to start the service manually (the service does not start during system startup).
2. Click on the **Submit** button.

Stopping SNMP service

To stop the SNMP service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting SNMP service

To start or restart the SNMP service, click the **Start** or **Restart** button.

Making CIM Settings

VTrak's CIM (Common Information Model [a protocol]) service provides a database for information about computer systems and network devices.

To change the CIM settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **CIM Setting** link in Management View.
4. Click the **Start** button to start the CIM service.
5. To enable CIM using a HTTP connection:
   - Choose the Yes option
   - Enter a port number in the field provided (5988 is the default)
6. To enable CIM using a HTTPS connection:
   - Choose the Yes option
   - Enter a port number in the field provided (5989 is the default)
7. To enable authentication for your CIM connection(s):
   - Choose the Yes option
   - Enter the old password in the field provided (password is the default)
   - Enter a new password in the field provided

   To change your password, the CIM service must be running. See "Starting or Restarting CIM service" on page 96.

   There is only one user. The default name is "cim." No changes are possible.

8. Click the **Submit** button.

Changing the Startup Setting

1. Under Startup Type:
   - Click on the Automatic option to start the service automatically during system startup. Recommended.
   - Click on the Manual option to start the service manually (the service does not start during system startup).
2. Click on the **Submit** button.

Stopping CIM service

To stop the CIM service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting CIM service

To start or restart the CIM service, click the **Start** or **Restart** button.

Making Netsend Settings

VTrak's Netsend service sends VTrak subsystem events in the form of text messages to your Host PC and other networked PCs. This service is normally Stopped and set to Manual start. See "Netsend Requirements" on page 97.

To change the Netsend settings:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Netsend** link.
4. Click the **Start** button to start the Netsend service.
5. Click the **Submit** button.

Adding Netsend recipients

See "Netsend Requirements" on page 97. To add a Netsent recipient:

1. In the Recipient Address field, type the IP address of the recipient PC.
2. Under Recipient filter, select the lowest level of Severity to be reported for each event.

   See "Setting-up User Event Subscriptions" on page 73 for an explanation of the Severity levels.
3. Click the **Update** button to add the new recipient to the list
4. Click the **Submit** button.
5. Click **OK** in the confirmation box.

Deleting Netsend Recipients

To delete a Netsend recipient:

1. Highlight the recipient you want to delete in the recipient list.
2. Click the **Delete** button to remove the recipient from the list.
3. Click the **Submit** button.
4. Click **OK** in the confirmation box.

Changing the Startup Setting

1. Under Startup Type:
   - Click on the Automatic option to start the service automatically during system startup. Recommended if you plan to use this feature.
   - Click on the Manual option to start the service manually (the service does not start during system startup). The default setting.
2. Click on the **Submit** button.

Stopping Netsend service

To stop the Netsend service:

1. Click the **Stop** button.
2. Click **OK** in the confirmation box.

Starting or Restarting Netsend service

To start or restart the Netsend service, click the **Start** or **Restart** button.

Netsend Requirements

In order to use Netsend:

- Netsend must be running the VTrak
- You must provide the IP address for each recipient PC
- The Messenger service must be running on each recipient PC

If your Netsend and Messenger service settings are correct but the recipient PC does not receive event messages, check the recipient PC's Firewall settings. Refer to your OS documentation for more information.

Exporting the User Database

You can export the User Database file to share user information and settings among multiple VTrak subsystems.

The Export action saves a text file a designated folder the Host PC. From there, you can import the User Database file to other VTrak subsystems.

To export the User Database file:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Export** link in Management View.
4. Click the **Export** button.
5. In the Opening export dialog box, click the **Save to Disk** option.
6. Click the **OK** button.

   The user database file is saved to the Host PC from which you access WebPAM PROe.

Note

The Encryption box is grayed out. Encryption is always enabled.

Importing a User Database

Caution

Do NOT use this function to update the VTrak firmware.

The Software Management–Import tab enables you to import the User Database file from the Host PC's file system to the VTrak subsystem. When you make user settings to one VTrak, you can export the User Database file to the Host PC. From there, you can import the User Database file to other VTrak s so that all have the same User information and settings.

To import the User Database file to this subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Software Management icon.
4. Click the Import tab.
5. Under the Type dropdown list, select *User Database*.
6. Enter the name of the file to be imported.

   Or, click the **Browse...** button to search for the file.

   Look for a file called *export*.
7. Click the **Submit** button.
8. Click the **Next** button.

   If the imported file is a valid user database, an warning will appear to inform you that it will overwrite the previous settings.
9. In the Warning box, click the **OK** button.

   This user settings are applied to this VTrak subsystem.

Note

The Decryption box is grayed out. Decryption is always enabled.

Updating the Firmware

This procedure is covered in Chapter 6: Maintenance. See “Updating the Firmware in WebPAM PROe” on page 213 for instructions.

Restoring Factory Defaults

VTrak includes a function to restore the default settings to its Firmware and Software settings.

Caution

The action of restoring default settings can disrupt your VTrak functions. Use this feature only when necessary and only the settings that must reset to default in order to set them correctly.

To access the Restore Defaults feature:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.

   The Administrative Tools list appears.
3. Click the **Restore Factory Defaults** link at the bottom of the list in Management View.

   The Restore Factory Defaults screen appears.
4. Check the Firmware and Software functions you want to restore to default settings.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.

The functions you selected will be automatically restored to their default settings.

Clearing Statistics

The Clear Statistics function clears statistical data on controllers, Fibre Channel ports, SAS ports, physical drives, and logical drives. To clear statistical data:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the **Clear Statistics** link.

   The Clear Statistics tab appears in Management View.
4. Click the **Submit** button.
5. In the confirmation box, type the word **confirm** in the field provided.
6. Click the **OK** button.

Shutting Down the Subsystem

You can only do part of this function in WebPAM PROe. Additional action is required, as described below. To shutdown the subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Shutdown link in Management View.

   A Shutdown or Restart tab will appear.
4. On the Shutdown or Restart tab, select *Shutdown* from the dropdown menu.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection will be lost.
8. Wait for no less than two minutes.
9. Manually turn off the power supply switches the back of the subsystem.

Monitoring the Shutdown

To monitor a shutdown, you must use the Command Line Interface (CLI) though a serial connection to the VTrak.

At the “administrator@CLI>” prompt, type **shutdown -a shutdown**.

When the “Shutdown complete. It is now safe to power off the subsystem.” message appears, turn off the power supply switches.

Restarting the Subsystem

You can only do part of this function in WebPAM PROe. Additional action is required, as described below. To restart the subsystem

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click the Shutdown link in Management View.

   A Shutdown or Restart tab will appear.
4. On the Shutdown or Restart tab, select *Restart* from the dropdown menu.
5. Click the **Submit** button.
6. In the warning box, click the **OK** button.
7. In the confirmation box, type the word **confirm** in the field provided.
8. Click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection will be lost.
9. Wait for two to three minutes.
10. In your browser, log into WebPAM PROe once again.

    If you cannot log in, wait for 30 seconds, and try again. Repeat until login is successful.

Monitoring the Restart

To monitor a restart, you must use the Command Line Interface (CLI) though a serial connection to the VTrak.

At the “administrator@CLI>” prompt, type **shutdown -a restart**.

When the “Login:” prompt appears, the restart is finished.

Managing Controllers

The RAID controllers are the heart of the VTrak subsystem. VTrak E-Class models have one or two controllers. Management of Controllers includes the following functions:

- Viewing the Controllers (page 105)
- Locating a Controller (page 105)
- Viewing Controller Information (page 106)
- Viewing Controller Statistics (page 107)
- Making Controller Settings (page 107)
- Clearing an Orphan Watermark (page 108)

Viewing the Controllers

To view information about the controllers:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.

   The controller information appears under the Information tab in Management View. Controller information includes:

   - Controller ID (1 or 2)
   - Alias, if assigned
   - Model, if applicable
   - Status – OK means normal
   - Readiness Status – Active or Standby
   - Locate – Click on the button to locate the controller. See below

VTrak subsystems with only one controller will always show that the second controller is “Missing.”

If your VTrak subsystem has two controllers and one is “Missing,” see “Controller Enters Maintenance Mode” on page 298 for more information.

Locating a Controller

To identify a specific controller in the VTrak subsystem:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. In Management View, click the **Locate Controller** button.
4. The Controller Dirty Cache ⚠ LED and Status ☑ LED, on the back of the Controller, will flash for one minute. See the illustrations below.

Figure 9. The VTrak E610f and E310f controller LEDs

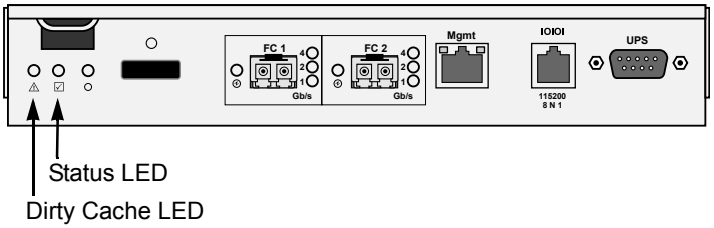
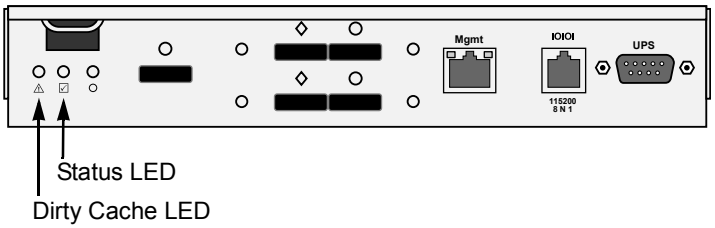


Figure 10. The VTrak E610s and E310s controller LEDs



Viewing Controller Information

To view Controller information:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.

   The controller information appears the Information tab in Management View.

Adjustable items

You can set or adjust the following items:

- Alias, if assigned
- Coercion, enable or disable
- Coercion Method
- SMART – Self-Monitoring, Analysis, and Reporting System for physical drives.
- SMART Polling Interval
- Write Back Cache Flush Interval
- Enclosure Polling Interval
- LUN Affinity

See “Making Controller Settings” on page 107.

Upgradable items

You can upgrade the following items:

- Boot loader Version
- Firmware Version number
- Software Version number
- Memory Size

See “Chapter 6: Maintenance” on page 213.

Viewing Controller Statistics

To view controller statistics:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the Information tab in Management View and select *Statistics* from dropdown menu.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 102.

Making Controller Settings

If your subsystem has two controllers, any settings you make to one controller will automatically apply to the other controller.

To make Controller settings:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click the Settings tab in Management View.
5. Make the following settings as needed:
   - Enter a name into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
   - Check the Enable LUN affinity box to enable the LUN affinity feature.

     If your subsystem has two controllers and Cache Mirroring is disabled, LUN Affinity is enabled automatically.
   - Check the SMART Log box to enable the Self-Monitoring, Analysis, and Reporting System (SMART).

- Enter a polling interval (1 to 1440 minutes) in SMART Polling Interval field.
- Check the Coercion Enabled box to enable disk drive capacity coercion.

  When disk drives of different capacities are used in the same array, coercion reduces the usable capacity of the larger disk drive(s) in order to match the smallest capacity drive.

  For more information, see “Capacity Coercion” on page 250.
- Select a coercion method from the Coercion Method dropdown menu. The choices are:

  GB Truncate – (Default) Reduces the useful capacity to the nearest 1,000,000,000 byte boundary.

  10GB Truncate – Reduces the useful capacity to the nearest 10,000,000,000 byte boundary.

  Group Rounding – Uses an algorithm to determine how much to truncate. Results in the maximum amount of usable drive capacity.

  Table Rounding – Applies a predefined table to determine how much to truncate.
- Enter a time interval (1 to 12 seconds) in the Write Back Cache Flush Interval field.

  For more information, see “Cache Policy” on page 246.
- Enter a time interval (15 to 255 seconds) in the Enclosure Polling Interval field.
- Check the Adaptive Writeback Cache box to enable the Adaptive Writeback Cache feature.

  For more information, see “Adaptive Writeback Cache” on page 247.

6. Click the **Submit** button.

   The changes take effect immediately.

Clearing an Orphan Watermark

An Orphan Watermark condition is the result of a disk drive failure during an NVRAM RAID level migration on a disk array.

To clear an Orphan Watermark:

1. Click the Subsystem icon in Tree View.
2. Click the Controllers icon.
3. Click the Controller icon.
4. Click on the Clear tab in Management View.
5. Click the **Submit** button.

The changes take effect immediately. If your subsystem has two controllers, clearing a condition on one controller will automatically apply to the other controller.

Managing Enclosures

On VTrak E-Class, enclosures include the main VTrak subsystem or *Head Unit* as well as additional enclosures that are connected to it through cascading or expansion. Enclosure Management includes the following functions:

- Viewing the Enclosures (page 110)
- Locating an Enclosure (page 110)
- Viewing Enclosure Topology (page 111)
- Viewing Enclosure Information (page 112)
- Making Enclosure Settings (page 112)
- Viewing FRU VPD Information (page 113)
- Checking the Batteries (page 113)
- Reconditioning a Battery (page 114)
- Silencing the Buzzer (page 114)
- Making Buzzer Settings (page 115)
- Testing the Buzzer (page 115)

Viewing the Enclosures

To view information about the enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

   The following information is shown:

   - Enclosure ID number
   - Enclosure Type
   - Operational Status
   - Status Description – Specific components in need of attention, if any

Locating an Enclosure

To locate an enclosure (subsystem):

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the **Locate Enclosure** button.

   The Disk Status LEDs on the front of the enclosure will flash for one minute. See the illustrations below.

Figure 11. VTrak E610f and E610s front view

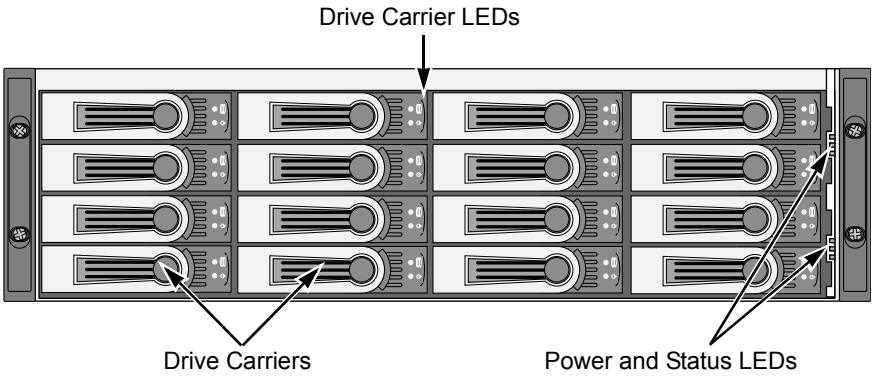


Figure 12. VTrak E310f and E310s front view

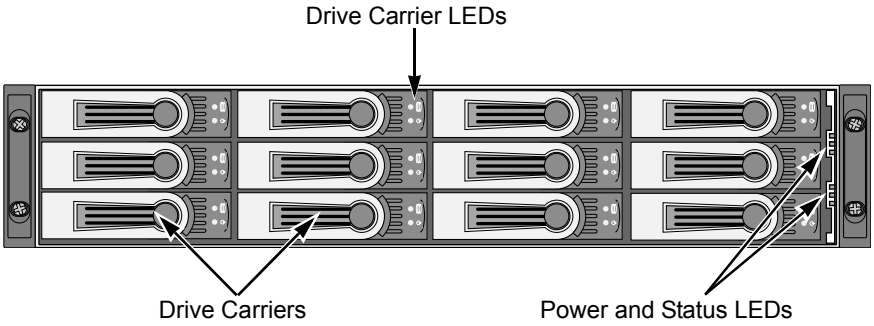
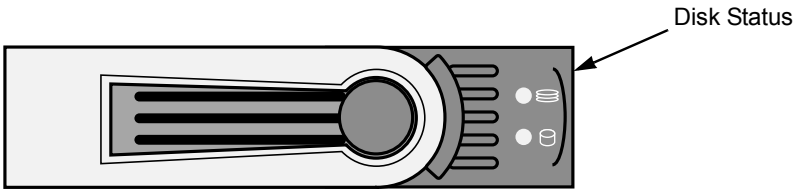


Figure 13. VTrak drive carrier LEDs



Viewing Enclosure Topology

To view Enclosure Topology:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

3. click the Topology tab in Management View.

Enclosure topology refers to the manner in which the data paths among the enclosures are connected:

- Individual Subsystem
- JBOD Expansion – One VTrak E-Class subsystem plus one or more JBOD expansion subsystems, managed through one subsystem or head unit
- RAID Subsystem Cascading – Multiple VTrak E-Class subsystems, managed through one subsystem or head unit

The logical connections for these arrangements are shown the Enclosure Topology tab. The physical connections for these arrangements are discussed in “Chapter 2: VTrak Installation” on page 11.

Viewing Enclosure Information

To view enclosure information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.

   Enclosure information appears the Information tab in Management View. You can monitor power supplies, cooling units, enclosure temperatures and voltages, and the battery.

Adjustable items

You can set or adjust the following items:

- Enclosure Warning and Critical temperature thresholds
- Controller Warning and Critical temperature thresholds

See “Making Enclosure Settings” on page 112.

For information on Enclosure problems, see “Chapter 8: Troubleshooting” on page 261.

Making Enclosure Settings

To make Enclosure settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Settings tab in Management View.
5. Enter a value in the following fields as necessary:

- Enclosure Warning Temperature Threshold
- Enclosure Critical Temperature Threshold
- Controller Warning Temperature Threshold
- Controller Critical Temperature Threshold

6. Click the **Submit** button.

   The changes take effect immediately.

Viewing FRU VPD Information

FRU VPD refers to Vital Product Data (VPD) information about Field Replaceable Units (FRU) in the enclosure. The number and type of FRU depends on the subsystem model.

To view FRU VPD information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the FRU VPD tab in Management View.

Use this information when communicating with Technical Support and when ordering replacement units. For contact information, see “Contacting Technical Support” on page 305.

Checking the Batteries

The Enclosure–Battery tab displays information about the cache backup battery (or batteries) in the VTrak subsystem enclosure. To check the batteries:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Battery tab in Management View.

Battery Notes

Each battery works with a controller. If the battery is present in the subsystem but the corresponding controller is not present, the battery will not appear in the interface.

If a battery does not reflect normal conditions and it is not currently under reconditioning, run the Recondition function before you replace the battery. See “Reconditioning a Battery” on page 114.

Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller

cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 107.

If a battery reaches the threshold temperature while charging or discharging, the charge or discharge pauses and the blower runs at high speed until the battery temperature falls below the threshold.

If the battery does not maintain normal values after a Recondition, replace the battery. See “Replacing a Cache Battery” on page 224.

VTrak automatically reconditions the battery every two months. To set the schedule, see “Scheduling an Activity” on page 69.

When you install a new battery, the cycle count shows 0. VTrak automatically runs a recondition on the battery to verify it. If you restart the subsystem or controller before reconditioning is finished, the battery is charged to 100%, then reconditioning starts again.

Reconditioning a Battery

To recondition the battery:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Battery tab in Management View.
5. From the Battery tab dropdown menu, select *Recondition*.
6. Click the **Submit** button.

   Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 107.

   VTrak automatically reconditions the battery every two months. To set the recondition schedule, see “Scheduling an Activity” on page 69.

Silencing the Buzzer

The buzzer sounds to inform you that the VTrak needs attention. See “VTrak is Beeping” on page 262 for more information.

You can silence the buzzer for the current trigger event.

To silence the Buzzer:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.

3. Click the Enclosure icon.
4. Click on the Buzzer tab in Management View.
5. Click the **Mute** button.

   The buzzer goes silent. If another trigger event occurs, the buzzer will sound again.

Making Buzzer Settings

To make buzzer settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. In Management View, from the Buzzer tab dropdown menu, choose *Settings*.
5. Check the Buzzer Enable box to enable the buzzer.

   Uncheck the Buzzer Enable box if you do not want the buzzer to sound.
6. Click the **Submit** button.

Testing the Buzzer

To test buzzer function:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Buzzer tab in Management View.
5. Click the **Sound** button.

   The buzzer will sound for one minute.

Managing Physical Drives

Managing Physical Drives deals with the physical disk drives installed in the VTrak subsystem enclosure, including the following functions:

- Viewing a List of Physical Drives (page 116)
- Identifying a Physical Drive (page 116)
- Making Global Physical Drive Settings (page 116)
- Viewing Physical Drive Information (page 117)
- Viewing Physical Drive Statistics (page 118)
- Making Physical Drive Settings (page 118)
- Clearing Stale and PFA Conditions (page 119)
- Forcing a Physical Drive Offline or Online (page 119)

Viewing a List of Physical Drives

To view a list of physical drives in this enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.

   The list of physical drives appears in Management View.

Identifying a Physical Drive

To identify physical drive in the VTrak subsystem enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. In Management View, click the physical drives in the graphic.

   The location of the physical drive is highlighted in the Enclosure Front View diagram.

Making Global Physical Drive Settings

Global settings apply to all of the physical disk drives installed in the VTrak subsystem enclosure. To make global physical drive settings:

1. Click the Subsystem icon in Tree View.

2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click the Global Settings tab in Management View.
6. Make the settings as needed.

   For SATA drives, check the boxes to enable:

   - Write Cache
   - Read Look Ahead Cache
   - Command Queuing (for disk drives that support Command Queuing)
   - From the DMA Mode dropdown menu, select a DMA mode.

   For SAS drives, check the boxes to enable:

   - Write Cache
   - Read Look Ahead Cache
   - Command Queuing (for disk drives that support Command Queuing)
   - Read Cache
7. Click the **Submit** button.

   The functions you enable here depend on whether the physical drives support those functions. See “Viewing Physical Drive Information” on page 117 to determine which functions a particular drive supports.

Viewing Physical Drive Information

To view physical drive information:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click on a Physical Drive icon.

Useful information provided here includes:

- The location of the physical drive is highlighted in the Enclosure Front View diagram.
- Operational Status – OK is normal. Can also show Rebuilding, Forced Online, Forced Offline, Transition Running, PDM Running, Media Patrol Running, Stale, PFA, Offline, or Dead.
- Configuration Status – The array to which the drive is assigned or its spare designation, including Unconfigured, Stale, PFA, Global Spare, Dedicated Spare, Revertible Global Spare, Revertible Dedicated Spare.

Adjustable Items

- Write Cache
- Read Look Ahead Cache
- Read Cache – SAS drive only
- Command Queuing
- DMA Mode – SATA drives only

See “Making Global Physical Drive Settings” on page 116.

Viewing Physical Drive Statistics

To view physical drive statistics:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click on a Physical Drive icon.
6. From the dropdown menu on the Information tab, choose *Statistics*.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 102.

Making Physical Drive Settings

An alias is the only setting you can make to an individual physical drive. All other settings are global. See “Making Global Physical Drive Settings” on page 116.

To make physical drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click on a Physical Drive icon.
6. Click the Settings tab in Management View.
7. Type an alias into the Physical Drive Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
8. Click the **Submit** button.

Clearing Stale and PFA Conditions

The Clear tab only appears when those conditions are present.

- Stale – The physical drive contains obsolete disk array information.
- PFA – The physical drive has errors resulting in a prediction of failure.

Be sure you have corrected the condition by a physical drive replacement, rebuild operation, etc., first. Then clear the condition. See “Physical Drive Problems” on page 293 for more information.

To clear a Stale or PFA status from a physical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click on a Physical Drive icon.
6. in Management View, click the Clear tab.
7. In the Confirmation box, click **OK** to confirm.

Note

If a physical drive has both a Stale and a PFA condition, click the Clear tab once to clear the Stale condition, then click again to clear the PFA condition.

Forcing a Physical Drive Offline or Online

The Physical Drive–Force Offline/Online tab enables you to force an:

- Online physical drive to go Offline
- Offline physical drive to go Online

The Force Offline/Online tab appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline or online is likely to cause data loss. Back up your data before you proceed. Use these functions only when required.

Important

Forcing a physical drive offline will cause your logical drives to become degraded. If Auto Rebuild is enabled and a spare drive is available, the disk array will begin rebuilding itself automatically.

To force a physical drive offline or online:

1. Click the Subsystem icon in Tree View.
2. Click the Enclosures icon.
3. Click the Enclosure icon.
4. Click the Physical Drives icon.
5. Click on a Physical Drive icon.
6. Click the Force Offline/Online tab in Management View.
7. Click the **Submit** button.
8. In the confirmation box, type the word **confirm** in the field provided.
9. Click the **OK** button.

Managing Disk Arrays

Disk Array Management includes the following functions:

- Viewing Disk Arrays (page 121)
- Creating a Disk Array (page 121)
- Deleting a Disk Array (page 125)
- Viewing Disk Array Information (page 126)
- Making Disk Array Settings (page 127)
- Creating a Logical Drive (page 127)
- Deleting a Logical Drive (page 129)
- Migrating a Disk Array (page 129)
- Rebuilding a Disk Array (page 130)
- Running PDM on a Disk Array (page 131)
- Transitioning a Disk Array (page 132)
- Preparing a Disk Array for Transport (page 132)

Viewing Disk Arrays

To view the disk arrays in this enclosure plus any expanded or cascaded enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.

   A list of disk arrays appears in Management View.

   Click the **DA** link to view a specific disk array. See “Viewing Disk Array Information” on page 126.

Creating a Disk Array

The CLU provides three methods of creating a disk array:

- **Automatic** – Creates a default disk array and logical drive based on unconfigured physical drives in the system. No user choices. See “Creating a Disk Array – Automatic” on page 122.
- **Express** – You select the RAID characteristics and type of application. Creates a disk array and logical drive(s) based on your input. See “Creating a Disk Array – Express” on page 122.
- **Advanced** – You specify all parameters for a new disk array. One logical drive will be made automatically when you create the disk array. If you select less than the total available capacity, you can use the remaining space to create additional logical drives at a later time. See “Creating a Disk Array – Advanced” on page 123.

Creating a Disk Array – Automatic

The Disk Array Automatic Creation option enables you to create a new disk array following a default set of parameters. One logical drive will be made automatically when you create the disk array. To create a Disk Array using the Automatic function:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Create tab in Management View.
4. From the Create tab dropdown menu, select *Automatic*.

   The following parameters display:

   - **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The ID number of the logical drive(s), their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array. A hot spare drive is created for all RAID levels except RAID 0, when five or more unconfigured physical drives are available
5. If you accept these parameters, click the **Submit** button.

   The new disk array appears in the Disk Array List the Information tab.

   If you do NOT accept these parameters, use the Advanced option to create your disk array.

Creating a Disk Array – Express

The Disk Array Express Creation option enables you to choose the parameters for a new disk array by specifying the characteristics you want. With this method, you can create multiple logical drives at the same time you create your disk array. However, all of the logical drives will be the same.

If you prefer to specific the parameters directly, use the Advanced option to create your disk array.

If you are uncertain about choosing parameters for your disk array, use the Automatic option.

To create a new disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.

3. Click the Create tab in Management View.
4. From the Create tab dropdown menu, select *Express*.
5. Check the boxes to select any one or combination of:
   - **Redundancy** – The array will remain available if a physical drive fails
   - **Capacity** – The greatest possible amount of data capacity
   - **Performance** – The highest possible read/write speed
   - **Spare Drive** – A hot spare drive is created when you select Redundancy, Spare Drive, and five or more unconfigured physical drives are available
6. In the Number of Logical Drives field, enter the number of logical drives you want to make from this disk array.
7. From the Application Type menu, select an application that best describes your intended use for this disk array:
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
8. Click the **Update** button.

   Or check the Automatic Update box and updates will occur automatically.

   The following parameters display:
   - **Disk Arrays** – The number of physical drives in the disk array, their slot numbers, configurable capacity, and the number of logical drives to be created
   - **Logical Drives** – The slot number of the logical drive(s), their RAID level, capacity, and stripe size
   - **Spare Drives** – The physical drive slot number of the dedicated hot spare assigned to this disk array (all RAID levels except RAID 0)

   If you accept these parameters, proceed to the next step.

   If you do NOT accept these parameters, review and modify your selections in the previous steps.
9. When you are done, click the **Submit** button.

The new disk array appears in the Disk Array List the Information tab.

Creating a Disk Array – Advanced

The Disk Array Advanced Creation option enables you to directly specify all parameters for a new disk array. One logical drive will be made automatically

when you create the disk array. If you select less than the total available capacity, you can use the remaining space to create additional logical drives at a later time.

If you are uncertain about choosing parameters for your disk array, use the Express or Automatic option to create your disk array.

To create a new disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. From the Create tab dropdown menu, select *Advanced*.

Step 1 – Disk Array Creation

4. Enter an alias for the disk array in the field provided.
5. Check the box if you want to enable Media Patrol.

   For more information, see “Media Patrol” on page 255.
6. Check the box if you want to enable PDM.

   For more information, see “Predictive Data Migration (PDM)” on page 256.
7. Highlight physical drives you want in the disk array from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click them to move them.
8. When you are done, click the **Next** button.

Step 2 – Logical Drive Creation

Logical Drive Creation enables you to specify logical drives under the new disk array. Enter the information for a logical drive, then click the **Update** button. If there is free capacity remaining, you can specify another logical drive now or wait until later.

9. Enter an alias for the logical drive in the field provided.
10. Choose a RAID level for the logical drive from the dropdown menu.

    The choice of RAID levels depends the number of physical drives you selected.
11. RAID 50 and 60 only – Specify the number of axles for your array.

    For more information on axles, see “RAID 50 Axles” on page 238 or “RAID 60 Axles” on page 240.
12. Specify a Capacity and the unit of measure (MB, GB, TB).

    This value will be the data capacity of the first logical drive in your new disk array. If you specify less than disk array's maximum capacity, the remainder will be available for additional logical drives which you can create later.
13. Specify a Stripe size from the dropdown menu.

    64 KB, 128 KB, 256 KB, and 1 MB are available. 64 KB is the default.

14. Specify a Sector size from the dropdown menu.

    512 B, 1 KB, 2 KB, and 4 KB are available. 512 B is the default.

15. Specify a Read (cache) Policy from the dropdown menu.

    Read Cache, Read Ahead Cache, and No Cache are available. Read Ahead is the default.

16. Specify a Write (cache) Policy from the dropdown menu.

    Write Back and Write Through (Thru) are available. Write Back is the default.

17. From the Preferred Controller ID dropdown menu, select a controller.

    The choices are Controller 1 or 2, or Automatic. This feature is only available on subsystems with two controllers and LUN Affinity enabled.

18. Click the **Update** button.

    A new logical drive is displayed under New Logical Drives.

    Repeat the above steps to specify additional logical drives as desired.

19. When you are done specifying logical drives, click the **Next** button.

Step 3 – Summary

The Summary lists the disk array and logical drive information you specified.

20. To proceed with disk array and logical drive creation, click the **Submit** button.

The new disk array appears in the Disk Array List the Information tab.

Note

This function does not automatically create a hot spare drive. After the disk array is created, you can create a hot spare drive for it. For more information, see “Creating a Spare Drive” on page 142.

Deleting a Disk Array

The Disk Arrays–Delete tab enables you to delete existing disk arrays.

Caution

If you delete a disk array, you also delete any logical drives that belong to it, along with the data in those logical drives. Back up any important data before deleting a disk array.

To delete a disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.

3. Click the Delete tab in Management View.
4. Check the box to the left of the disk array you want to delete.
5. Click the **Submit** button.
6. In the confirmation box, type the word confirm in the field provided.
7. Click the **OK** button.

The selected disk array disappears from the Disk Array List the Information tab.

Viewing Disk Array Information

To view Disk Array information:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.

   The disk array information is shown in Management View.

Disk Array Operational Status

- OK – This is the normal state of a logical drive. When a logical drive is Functional, it is ready for immediate use. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.
- Synchronizing – This condition is temporary. Synchronizing is a maintenance function that verifies the integrity of data and redundancy in the logical drive. When a logical drive is Synchronizing, it will function and your data is available. However, access will be slower due to the synchronizing operation.
- Critical/Degraded – This condition arises as the result of a physical drive failure. A degraded logical drive will still function and your data is still available. However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it.
- Rebuilding – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). When a logical drive is rebuilding, it will function and your data is available. However, access will be slower due to the rebuilding operation.
- Transport Ready – After you perform a successful Prepare for Transport operation, this condition means you can remove the physical drives of this disk array and move them to another enclosure or different drive slots. After you relocate the physical drives, the disk array status will show OK.

Adjustable Items

- Alias – Optional.

- Media Patrol – Enabled or disabled.
- PDM – Enabled or disabled.

See “Making Disk Array Settings” on page 127.

Making Disk Array Settings

To make Disk Array settings:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Settings tab in Management View.
5. Optional. Enter an alias in the Disk Array Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
6. To enable Media Patrol support, check the Media Patrol box.
7. To enable PDM support, check the PDM box.
8. Click the **Submit** button.

Creating a Logical Drive

When you create a disk array, you automatically create one logical drive also. If the initial logical drive used less than the full capacity of the disk array, you can create additional logical drives from the same disk array.

To create a logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Create LD tab in Management View.
5. Enter an alias (name) in the Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
6. From the RAID Level dropdown list, select a RAID level for this logical drive.

   All RAID levels supported by the disk array appear in the list. See “Choosing a RAID Level” on page 242.
7. RAID 50 and 60 only – Specify the number of axles for your array.

For more information on axles, see “RAID 50 Axles” on page 238 or “RAID 60 Axles” on page 240.

8. Enter a capacity and select unit of measure (MB, GB, TB).

   The default value is the available capacity of the disk array. You can use this value or any lesser amount.

9. From the Stripe dropdown menu, select a Stripe size for this logical drive.

   The choices are 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB. 64 KB is the default. See “Choosing Stripe Size” on page 245.

10. From the Sector dropdown menu, select a Sector size for this logical drive.

    The choices are 512 B, 1 KB, 2 KB, and 4 KB. 512 B is the default. See “Choosing Sector Size” on page 245.

11. From the Read Policy dropdown menu, select a Read Cache policy for this logical drive.

    The choices are Read Cache, Read Ahead, and No (read) Cache. Read Ahead is the default. See “Cache Policy” on page 246.

12. From the Write Policy dropdown menu, select a Write Cache policy for this logical drive.

    The choices are Write Through (thru) and Write Back. Write Back is the default. If you selected No Cache under Read Cache, this setting will be Write Through. See “Cache Policy” on page 246.

13. From the Preferred Controller ID dropdown menu, select a controller.

    The choices are Controller 1 or 2, or Automatic. This feature is only available on subsystems with two controllers and LUN Affinity enabled.

14. Click the **Update** button to enter the logical drive parameters.
15. Review the results. If there is remaining space the disk array, you can create another logical drive, following the steps above. Each logical drive can have a different set of parameters.
16. Click the **Next** button when you are done.

    A new window displays with the disk array information and the proposed logical drives with their parameters.

17. Click the **Submit** button create the logical drives.

The new logical drive appears in the Logical Drive List the Information tab.

If you created a fault-tolerant logical drive (any RAID level except RAID 0), the Operational Status of new logical drive will display *Synchronizing* for several minutes after creation. You can use the logical drive during this period but read/write performance could be slower than normal.

Deleting a Logical Drive

Caution

All data the logical drive will be lost. Back up any valuable data before deleting the logical drive.

To delete a logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Delete LD tab in Management View.
5. Check the box to the left of the logical drive you want to delete.
6. Click the **Submit** button.

   In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.

The selected logical disappears from the Logical Drive List the Information tab.

Migrating a Disk Array

The action of migrating a disk array means either or both:

- Change the RAID Level
- Expand the storage capacity

For a list of Migration options and other important information, see “RAID Level Migration” on page 252.

Notes

- You can add physical drives to a RAID 50 or RAID 60 array but you cannot change the number of axles.
- If you add an odd number of physical drives to a RAID 10 array, it will become a RAID 1E array by default.

To Migrate an existing disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.

4. From the dropdown menu the Background Activities tab, select *Start Migration*.
5. Highlight physical drives you want in the disk array from the Available list and press the >> button to move them to the Selected list.

   You can also double-click them to move them.
6. When you are done, click the **Next** button.
7. Select a new RAID Level, if desired.
8. To expand the disk array's capacity, check the Expand Capacity box.
9. If you checked the Expand Capacity box, enter a number into the Capacity field and select the appropriate unit of measure (MB, GB, TB).
10. Under Capacity Usage, highlight the logical drive whose RAID level you want to change or whose capacity you want to expand.
11. Click the **Update** button.

    The logical drive changes to reflect your choices.
12. Update other logical drives using the same method.
13. When you are done making the changes, click the **Next** button.
14. Click the **Submit** button to begin Migration.

To set Migration priority, see “Making Background Activity Settings” on page 66.

Rebuilding a Disk Array

When you rebuild a disk array, you are actually rebuilding the data on a replacement physical drive.

Rebuilding Automatically

Normally, a disk array would rebuild itself using a hot disk drive, after going Critical. However, if the Auto Rebuild function is disabled or no spare drives are available, you must initiate the procedure.

To enable Auto Rebuild, see “Making Background Activity Settings” on page 66.

To create a spare drive, see “Creating a Spare Drive” on page 142.

For more information, see “Hot Spare Drive(s)” on page 251.

Rebuilding Manually

If a physical drive has failed, identify and replace the drive, then rebuild the disk array as described below:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.

If there are multiple disk arrays, choose the icon with the yellow !.

4. From the dropdown menu the Background Activity tab, select *Start Rebuild*.
5. Select the Source physical drive.

   This is a remaining functional physical drive in the disk array.
6. Select the Target physical drive.

   This is the replacement physical drive.
7. Click the **Submit** button.

The Disk Array Background Activity tab shows the rebuild progress on the replacement (target) physical drive. Depending the size of the physical disk involved, this process will take some time.

To view more information, click the **Rebuild on PDx** link.

To set Rebuild priority, see “Making Background Activity Settings” on page 66.

Running Media Patrol on a Disk Array

Media Patrol checks the magnetic media on physical drives. When it finds the specified number of bad blocks, it will trigger PDM. See “Making Background Activity Settings” on page 66 and “Running PDM” on page 68.

You can schedule Media Patrol to run automatically, see “Scheduling an Activity” on page 69.

To start Media Patrol:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. From the dropdown menu the Background Activities tab, choose *Start Media Patrol*.
5. Click the **Start** button.

Running PDM on a Disk Array

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare physical drive, similar to Rebuilding. But unlike Rebuilding, PDM acts *before* the disk drive fails and your Logical Drive goes Critical.

See “Predictive Data Migration (PDM)” on page 256.

To start PDM:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.

3. Click the Disk Array icon.
4. Click the Background Activities tab in Management View.
5. From the dropdown menu the Background Activities tab, choose *Start PDM*.
6. In the next screen, select the Source and Target physical drives.

   The suspect physical drive is the source. The replacement physical drive is the target.
7. Click the **Start** button.

Transitioning a Disk Array

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status. For more information, see “Transition” on page 257.

In order to run the Transition function:

- The spare drive must be Revertible.
- You must specify an unconfigured physical drive of the same or larger capacity to replace the revertible spare drive.

To run Transition:

1. Click the Subsystem icon in Tree View.
2. From the dropdown menu on the Background Activities tab, select *Start Transition*.
3. Select an unconfigured physical drive from the list of available drives.
4. From the Target Physical Drive dropdown menu, choose an unconfigured physical drive.
5. Click the **Submit** button.

After Transition is completed, refresh the screen. The revertible spare drive will be listed under the Spare Drives icon and the disk array’s operational status will show OK.

To set Transition priority, see “Making Background Activity Settings” on page 66.

Preparing a Disk Array for Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same VTrak enclosure
- From one VTrak enclosure to another

Important

Before you can use this feature, the disk array's Operational Status must be OK.

To prepare a disk array for transport:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Transport tab in Management View.
5. Click the **Submit** button.
6. In the confirmation box, type the word **confirm** in the field provided.
7. Click the **OK** button.
8. After the Transition is complete, move the physical drives comprising the disk array to their new locations.
9. Click the **Refresh** button in your Browser.

   The drives appear in their new locations and disk array status displays OK.

Managing Logical Drives

Logical drives are made from disk arrays. In the Tree, you can see a graphic representation of the logical drives that belong to each array. You can see a summary of all logical drives in the subsystem under Logical Drive Summary.

Logical drive management includes the following functions:

- Viewing Information for All Logical Drives (page 134)
- Viewing Logical Drive Information (page 135)
- Viewing Logical Drive Statistics (page 136)
- Making Logical Drive Settings (page 136)
- Initializing a Logical Drive (page 137)
- Running Redundancy Check (page 137)
- Viewing the Logical Drive Check Table (page 138)
- Making Logical Drive LUN Settings (page 139)

Viewing Information for All Logical Drives

To view information about all logical drives in a disk array:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon

Logical Drive Status

- OK – This is the normal state of a logical drive. When a logical drive is Functional, it is ready for immediate use. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.
- Synchronizing – This condition is temporary. Synchronizing is a maintenance function that verifies the integrity of data and redundancy in the logical drive. When a logical drive is Synchronizing, it will function and your data is available. However, access will be slower due to the synchronizing operation.
- Rebuilding – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). When a logical drive is rebuilding, it will function and your data is available. However, access will be slower due to the rebuilding operation.
- Critical – This condition arises as the result of a physical drive failure. A degraded logical drive will still function and your data is still available.

However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it.

- Offline – This condition arises as the result of a second physical drive failure. An Offline logical drive is not accessible but some or all of your data may remain intact. You must determine the cause of the problem and correct it.
- Transport Ready – After you perform a successful Prepare for Transport operation, this condition means you can remove the physical drives of this disk array and move them to another enclosure or different drive slots. After you relocate the physical drives, the disk array status will show OK.

To create a logical drive, see “Creating a Logical Drive” on page 127.

To delete a logical drive, see “Deleting a Logical Drive” on page 129.

For a Degraded or Offline logical drive, see “Critical & Offline Disk Arrays” on page 289.

Viewing Logical Drive Information

To view information for a single logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.

To specify an Alias or set the Read and Write Policies, click the Settings tab.

Logical Drive Status

See “Logical Drive Status” on page 134.

Logical Drive Synchronization

Synchronization is an automatic procedure applied to logical drives when they are created. Yes means the logical drive was synchronized.

Adjustable Items

- Alias – Optional
- Read Policy
- Write Policy
- Preferred Controller ID

See “Making Logical Drive Settings” on page 136.

Viewing Logical Drive Statistics

To view information for a single logical drive:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. In Management View, click on the dropdown menu on the Information tab and choose *Statistics*.

Clearing Statistics

To clear statistics, see “Clearing Statistics” on page 102.

Making Logical Drive Settings

To make Logical Drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. Click the Settings tab in Management View.
7. Optional. Enter an alias in the Logical Drive Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words, and underscore. An alias is optional.
8. From the Read Policy dropdown menu, select a Read Cache policy.

   The choices are Read Cache, Read Ahead, and No Cache.
9. From the Write Policy dropdown menu, select a Write Cache policy.

   The choices are Write Back and Write Through (Thru). If you select No Read Cache, Write policy is automatically Write Through.
10. From the Preferred Controller ID dropdown menu, select the preferred controller to access this logical drive.

    The choices are 1 and 2. This feature is only available on subsystems with two controllers and LUN Affinity enabled. If N/A is shown, there is only one controller in the enclosure.

11. Click the **Submit** button.

Initializing a Logical Drive

Initialization is done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. The action is useful because there may be residual data the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives.

Caution

When you initialize a logical drive, all the data the logical drive will be lost. Backup any important data before you initialize a logical drive.

Initialize a Logical Drive:

1. Click the Subsystem icon in Tree View.
2. Click the Logical Drive Summary icon.
3. Click the icon of the logical drive you want to Initialize.

   You can also start Initialization from the Subsystem icon Background Activities tab
4. Click the Background Activities tab in Management View.
5. From the Background Activities dropdown menu, select *Initialization*.
6. To select Quick Initialization, check the box.

   If you checked the box, enter a value in the Quick Initialization Size field. This value is the size of the initialization blocks in MB.
7. If you did not select Quick Initialization, enter a hexidecimal value in the Initialization Pattern in Hex field or use the default 00000000 value.
8. Click the **Submit** button.
9. In the confirmation box, type the word **confirm** in the field provided.
10. Click the **OK** button.

To view the progress of the Initialization, click the Background Activity tab.

To set Initialization priority, see “Making Background Activity Settings” on page 66.

Running Redundancy Check

Redundancy Check is a routine maintenance procedure for fault-tolerant logical drives (those with redundancy) that ensures all the data matches exactly.

Redundancy Check can also correct inconsistencies. You can also schedule a Redundancy Check. See “Scheduling an Activity” on page 69.

Redundancy Check a Logical Drive:

1. Click the Subsystem icon in Tree View.
2. Click the Logical Drive Summary icon.
3. Click the icon of the logical drive you want to Initialize.

   You can also start Redundancy check from the Subsystem icon Background Activities tab
4. From the dropdown menu on the Background Activities tab, select *Redundancy Check*.
5. To select *Auto Fix*, check the box.

   This feature attempts to repair the problem when it finds an error.
6. To select *Pause On Error*, check the box.

   This feature stops the process when it finds an error.

   If Auto Fix is also checked, the process stops only when it finds a non-repairable error.
7. Click the **Submit** button.

To view the progress of the Redundancy Check, click the Background Activity tab.

To set Redundancy Check priority, see “Making Background Activity Settings” on page 66.

Viewing the Logical Drive Check Table

The Logical Drive Check Table displays errors related to a logical drive. Use this information to evaluate the integrity of the logical drive and to determine whether corrective action is needed. To View the tables:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. Click the Check Table tab in Management View.
7. Click the option for the table you want to see.

   The default is All tables.

If there are entries, they are listed as follows:

- Entry Number – A number assigned to each block of entry.
- Table Type – Read Check, Write Check or Inconsistent Block (see below).
- Start Logical Block Address – LBA of the first block for this entry.
- Count – Number of continuous blocks starting from this LBA.

Table Definitions

- Read Check Table – Contains a list of read errors for this logical drive.
- Write Check Table – Contains a list of write errors for this logical drive.
- Inconsistent Block Table – Contains a list of inconsistent blocks for this logical drive. Mirror data for RAID Levels 1, 1E, and 10 or Parity data for RAID Levels 5, 6, 50, and 60 identified by the Redundancy Check (a background function).

Making Logical Drive LUN Settings

For Fibre Channel and SAS, LUN Masking is the process of applying a LUN Map so that each initiator can only access the LUNs specified for it.

Before you can specify an initiator for your LUN map, you must add the initiator to the VTrak 's initiator list. See “Adding an Initiator” on page 83 or page 86.

You must enable LUN Masking in order apply a LUN map. See “Enabling LUN Masking” on page 88.

To specify a LUN Map:

1. Click the Subsystem icon in Tree View.
2. Click the Disk Arrays icon.
3. Click the Disk Array icon.
4. Click the Logical Drives icon
5. Click the Logical Drive icon.
6. Click the LUN Map tab in Management View.
7. From the Unassigned Initiator List, click on an initiator to select it.
   Or type the initiator name into the Initiator Name field.
8. Type a LUN into the Map to LUN field.
9. Click the **Assign** button.
   The initiator appears in the Assigned Initiator List.
10. Click the **Submit** button.

Notes

- Obtain the initiator name from the initiator utility on your host system.
- The initiator name you input must match exactly in order for the connection to work.

LUN Mapping Parameters

- Initiator Name
  - Fibre Channel – A Fibre Channel initiator name is the World Wide Port Name of the device and is composed of a series of eight, two-digit hexadecimal numbers.
  - SAS – A SAS initiator name is the SAS address of the HBA card in the Host PC.
- Alias – Optional. A common name for an iSCSI initiator
- Symbolic Name – Optional. A common name for a Fibre Channel initiator
- Port ID – Port ID of the Fibre Channel port for this initiator
- LUN – Logical Unit Number on this logical drive for the selected initiator. You must enter different LUN numbers for each logical drive.

Managing Spare Drives

When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array will begin to rebuild automatically using the spare drive. See “Critical & Offline Disk Arrays” on page 289.

Spare drive management includes the following functions:

- Viewing a List of Spare Drives (page 141)
- Locating a Spare Drive (page 141)
- Creating a Spare Drive (page 142)
- Deleting Spare Drive (page 143)
- Making Spare Drive Settings (page 143)
- Running Spare Check (page 144)

Viewing a List of Spare Drives

To view a list of spare drives:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.

The information includes:

- ID – The unique ID number assigned to the spare drive.
- Operational Status – OK is normal. Can also show Rebuilding, Transition Running, PDM Running, or Offline.
- Physical Drive ID – The ID number of the physical drive in the subsystem enclosure.
- Capacity – The data storage capacity of this spare drive.
- Revertible – Yes or No. A revertible spare drive automatically returns to its spare drive assignment after the failed physical drive in the disk array is replaced.
- Type – Global, can be used by any disk array. Dedicated, can only be used by the assigned disk array.
- Dedicated to Array – For dedicated spares, the disk array to which it is assigned. Global spares show N/A.

Locating a Spare Drive

To locate a physical drive assigned as a spare drive in the VTrak subsystem enclosure:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.

3. Click the Spare Drive icon.

   In Management View, the Enclosure Front View diagram appears with the location of the spare drive highlighted.

Creating a Spare Drive

Important

- There must be an unconfigured physical drive available for selection as a spare drive. See “Viewing a List of Physical Drives” on page 116.
- Be sure the unconfigured physical drive has adequate capacity to replace the largest drive in the disk array.

To create a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the Create tab in Management View.
4. Select a spare type, Global or Dedicated.

   Global can be used by any disk array. Dedicated can only be used by the assigned disk arrays
5. To make a revertible spare drive, check the Revertible box.

   A revertible spare drive can be returned to spare drive status after it replaces a failed drive in a disk array. See “Transition” on page 257 for more information.
6. In the Physical drives field, highlight the physical drive you want to assign as a spare drive in the Available list and press the **>>** button to move the drive to the Selected list.

   You can also double-click drives to move them.
7. If you selected a Dedicated spare drive, in the Dedicated to Disk Arrays field, highlight disk arrays to which you want assign the spare drive from the Available list and press the **>>** button to move the array to the Selected list.

   You can also double-click arrays to move them.
8. Click the **Update** button.

   Your choices are displayed under New Hot Spare Drives.
9. If you agree with the proposed choices, click the **Submit** button.

Deleting Spare Drive

Note

If an existing spare drive has the wrong parameters for your needs, click the Settings tab to change the parameters rather than delete the spare drive and create a new one.

To delete a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the Delete tab in Management View.
4. Check the box to the left of the spare drive you want to delete.
5. Click the **Submit** button.

   In the confirmation box, type the word **confirm** in the field provided.
6. Click the **OK** button.

Making Spare Drive Settings

The Spare Drive–Settings tab enables you to change the settings of an existing spare drive. To change spare drive settings:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the Spare Drive icon.
4. Click the Settings tab in Management View.
5. Select a spare type, Global or Dedicated.

   Global can be used by any disk array. Dedicated can only be used by the assigned disk arrays
6. To make a revertible spare drive, check the Revertible box.

   A revertible spare drive automatically returns to its spare drive assignment after the failed physical drive in the disk array is replaced.
7. If you selected a Dedicated spare drive, in the Dedicated to Disk Arrays field, highlight the disk arrays to which you want assign the spare drive from the Available list and press the **>>** button to move them to the Selected list.

   You can also double-click array to move it.
8. Click the **Submit** button.

Running Spare Check

Spare Check verifies the operational status of your spare drives. You can also schedule a Spare Check. See “Scheduling an Activity” on page 69.

To check a spare drive:

1. Click the Subsystem icon in Tree View.
2. Click the Spare Drives icon.
3. Click the Spare Check tab in Management View.
4. From the Physical Drive dropdown menu, select the spare drive you want to check.

   Or select *All* to check all the spare drives at the same time.
5. Click the **Submit** button.

The results of the Spare Check appear under Spare Check Status in the Information tab. “Healthy” means normal condition.

Working with the Logical Drive Summary

The Logical Drive Summary displays a list of all logical drives in the VTrak enclosure plus the expanded or cascaded enclosures. This list does not arrange the logical drives under the disk array to which they belong nor under the enclosure in which they are located.

Logical Drive Summary includes the following functions:

- Viewing a List of All Logical Drives (page 145)
- Viewing Individual Logical Drive Information (page 145)

Viewing a List of All Logical Drives

To view a list of all logical drives in all enclosures:

1. Click the Subsystem icon in Tree View.
2. Click the Drive Summary icon.

Viewing Individual Logical Drive Information

1. Click the Subsystem icon in Tree View.
2. Click the Drive Summary icon.
3. Click the Logical Drive icon.

   The information and location for the logical drive appear in Management View. See Viewing Logical Drive Information (page 135).

Chapter 5: Management with the CLU

This chapter covers the following topics:

- Logging into the CLU (page 148)
- Running Quick Setup (page 151)
- Managing the Subsystem (page 152)
- Managing the Controllers (page 155)
- Managing the Enclosure (page 158)
- Managing Physical Drives (page 162)
- Managing Disk Arrays (page 165)
- Managing Logical Drives (page 176)
- Managing the Network Connection (page 179)
- Managing Fibre Channel Connections (page 181)
- Managing SAS Connections (page 184)
- Managing Background Activity (page 186)
- Working with the Event Viewer (page 188)
- Managing Spare Drives (page 190)
- Working with LUN Mapping (page 193)
- Managing Users (page 196)
- Working with Software Management (page 199)
- Flashing through TFTP (page 206)
- Clearing Statistics (page 207)
- Restoring Factory Defaults (page 208)
- Shutting Down the Subsystem (page 209)
- Restarting the Subsystem (page 211)
- Making Buzzer Settings (page 212)

For information about VTrak's audible alarm and LEDs, see "Chapter 8: Troubleshooting" on page 261.

Logging into the CLU

There are two connections methods for the CLU:

- **Serial** – Requires a null-modem cable to connect the serial ports on the Host PC and VTrak
- **Telnet** – Requires a network connection between the Host PC and VTrak's Management Port

Making a Serial Connection

Before you begin, be sure the null modem cable is connected between the Host PC and VTrak, and that both machines are booted and running. Then do the following actions:

1. Start your PC's terminal emulation program.
2. Press **Enter** once to launch the CLU.

Making a Telnet Connection

If your Telnet connection has not been setup, refer to "Making Serial Cable Connections" on page 32.

To start the telnet program:

1. Go to the command line prompt (Windows) or click the terminal icon (Linux), then run:

   telnet 192.168.1.56 2300

   The IP address above is only an example. Use your VTrak's Management port IP address. *2300* is the Telnet port for the VTrak.

   The telnet login screen appears:

2. At the Login prompt, type the user name and press Enter.

   The default user name is *administrator*.

3. At the Password prompt, type the password and press Enter.

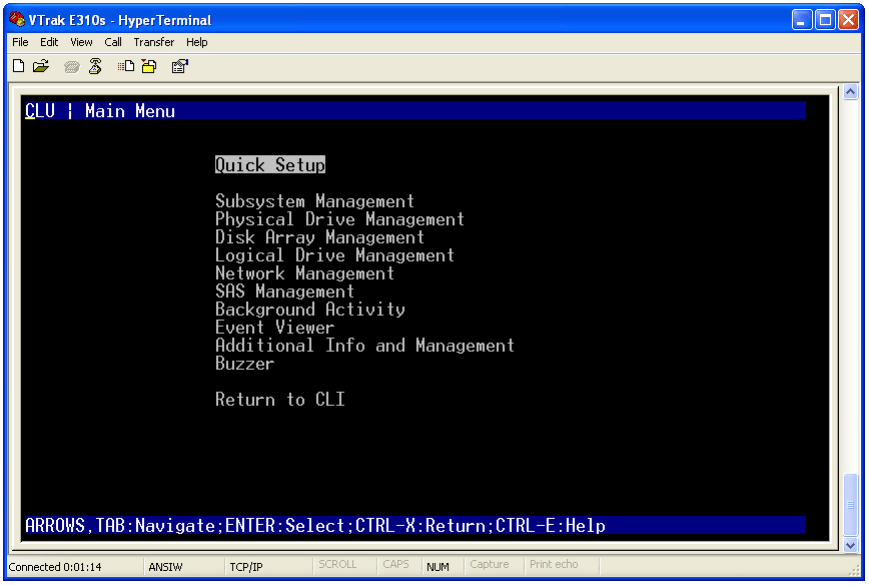
   The default password is *password*.

   The CLI screen appears.

4. At the CLI prompt, type **menu** and press Enter

   The CLU Main Menu appears.

Figure 4. The CLU main menu



Quick Setup – A sequence of four steps to setup System Date & Time, Management Port, and RAID Configuration.

Subsystem Management – View controller information, lock/unlock the controller, set date and time, and monitor the enclosure.

Physical Drive Management – View disk drive assignments and parameters, change disk drive cache settings and command queuing, and locate a physical drive.

Disk Array Management – View disk array information, create and delete disk arrays, transport, rebuild, PDM, and transition functions, and locate a disk array, create and delete logical drives.

Logical Drive Management – View logical drive information, name logical drives, initialization and redundancy check, and locate a logical drive.

Network Management – Set IP addresses for Management Port, gateway, and DNS server; subnet mask.

Fibre Channel Management – Node information, Port information, settings and statistics, list of logged-in devices, list of initiators.

SAS Management – Node information, Port information, settings, status, and statistics; SFP information, list initiators.

Background Activity – Settings for Media Patrol, Auto Rebuild, Rebuild, Migration, PDM, Transition, Synchronization, Initialization, Redundancy Check rate, and thresholds.

Event Viewer – View the event logs.

Additional Info and Management – Spare Drives, LUN Mapping, User management, EMail, SLP, Webserver, Telnet, SNMP, CIM, and Netsend settings, firmware flash, clear statistics and restore factory default settings.

Buzzer – Enable, disable or silence the buzzer (audible alarm).

Accessing Online Help

To access online help on any CLU screen, press Ctrl-E.

To return to the CLU, press Enter.

Logging out of the CLU

1. Highlight *Return to Previous Menu* and press Enter.
   Repeat this action until you arrive at the Main Menu.
2. From the Main Menu, highlight *Return to CLI* and press **Enter** to exit
3. Close the terminal emulation, Telnet or terminal window.

Running Quick Setup

Quick Setup is discussed under “Setting up the Serial Connection” on page 35.

Managing the Subsystem

Subsystem Management includes the following functions:

- Setting an Alias for the Subsystem (page 152)
- Setting Redundancy for the Subsystem (page 152)
- Setting Cache Mirroring for the Subsystem (page 152)
- Running Media Patrol (page 153)
- Locking or Unlocking the Subsystem (page 153)
- Setting Subsystem Date and Time (page 154)

Setting an Alias for the Subsystem

An alias is optional. To set an Alias for this subsystem:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Type and alias into the Alias field.

   Maximum of 48 characters. Use letters, numbers, space between words and underscore.
3. Press Ctrl-A to save your settings.

Setting Redundancy for the Subsystem

This feature applies to models with dual controllers.

To set redundancy:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Redundancy Type* and press the spacebar to toggle between Active-Active and Active-Standby.
   - Active-Active – Both RAID controllers are active and can share the load
   - Active-Standby – One RAID controller is in standby mode and goes active if the other fails
3. Press Ctrl-A to save your settings.

Setting Cache Mirroring for the Subsystem

This option applies only to subsystems with two controllers. To use Cache Mirroring, the Redundancy Type must be set to Active-Active.

To change Cache Mirroring for this subsystem:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Redundancy Type* and press the spacebar to toggle between Active-Active and Active-Standby.

3. Highlight Cache Mirroring and press the spacebar to toggle between Enabled and Disabled.
4. Press Ctrl-A to save your settings.
5. Restart the subsystem.

   See “Restarting the Subsystem” on page 211.

Notes

- If you disable Cache Mirroring, LUN Affinity will be enabled automatically.
- If you change Cache Mirroring, be sure both controllers are properly installed in the subsystem before you restart.

Running Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays and spare drives. It does not check unconfigured drives.

To start, stop, pause or resume Media Patrol:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Media Patrol* and press enter.
3. Highlight *Start*, *Stop*, *Pause*, or *Resume* and press Enter.
4. If you chose Stop, press Y to confirm.

Locking or Unlocking the Subsystem

The lock prevents other sessions (including by the same user) from making a configuration change to the controller until the lock expires or a forced unlock is done. When the user who locked the controller logs out, the lock is automatically released.

Setting the Lock

To set the lock:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. In the Lock Time field, type a lock time in minutes.

   1440 minutes = 24 hours
4. Highlight *Lock* and press Enter.

Resetting the Lock

To reset the lock with a new time:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. In the Lock Time field, type a lock time in minutes.
   1 to 1440 minutes (24 hours)
4. Highlight *Renew* and press Enter.

Releasing the Lock

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. Highlight *Unlock* and press Enter.

Releasing a Lock set by another user

To release somebody else's lock:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Lock Management* and press Enter.
3. Highlight *Force Unlock* and press the Spacebar to change to *Yes*.
4. Highlight *Unlock* and press Enter.

Setting Subsystem Date and Time

Use this screen to make Date and Time settings:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Modify System Date and Time* and press Enter.
3. Highlight the System Date or System Time setting.
4. Press the backspace key to erase the current value.
5. Type in a new value.
6. Press Ctrl-A to save your settings.

Managing the Controllers

Controller Management includes the following functions:

- Viewing Controller Information (page 155)
- Clearing an Orphan Watermark (page 155)
- Making Controller Settings (page 156)
- Locating the Controller (page 157)

Viewing Controller Information

Controller Management includes information, settings and statistics.

To access Controller Management:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight the controller you want and press Enter.

   Basic Controller information displays.

To access additional controller information, highlight *Advanced Information* and press Enter.

To access controller statistics, highlight *Controller Statistics* and press Enter.

Clearing an Orphan Watermark

This condition is the result of a disk drive failure during an NVRAM RAID level migration on a disk array.

To clear an orphan watermark:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight one of the controllers and press Enter.
4. Highlight *Clear Orphan Watermark* and press Enter.

The condition is cleared. See “Physical Drive Failed” on page 293 for more information.

Making Controller Settings

If your subsystem has two controllers, any settings you make to one controller will automatically apply to the other controller.

To make Controller settings:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *Controller Settings* and press Enter.
5. Make the following settings as required:
   - Type and alias into the Alias field.

     Maximum of 48 characters. Use letters, numbers, space between words and underscore. An alias is optional.
   - Highlight *LUN Affinity* and press the spacebar to toggle between *Enabled* and *Disabled*.

     If your subsystem has two controllers and Cache Mirroring is disabled, LUN Affinity is enabled automatically.
   - Highlight *Coercion* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Coercion Method* and press the spacebar to toggle through:

     GB Truncate – Reduces the capacity to the nearest 1 GB boundary

     10 GB Truncate – Reduces the capacity to the nearest 10 GB boundary

     Grp (group) Rounding – Uses an algorithm to determine truncation. Results in the maximum amount of usable drive capacity

     Table Rounding – Applies a predefined table to determine truncation
   - Highlight *Cache Flush Interval* and press the backspace key to erase the current value. Type a new interval value (1 to 12 seconds).
   - Highlight *SMART* and press the spacebar to toggle between *Enable* and *Disable*.
   - Highlight *SMART Poll Interval* and press the backspace key to erase the current value. Type a new interval value (1 to 1440 minutes).
   - Highlight *Poll Interval* and press the backspace key to erase the current value. Type a new interval value (15 to 255 seconds).
   - Highlight *Adaptive Writeback Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
6. Press Ctrl-A to save your settings.

Locating the Controller

To locate this controller:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Controller Management* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *Controller Settings* and press Enter.
5. Highlight *Locate Controller* and press Enter.

   Controller Dirty Cache ⚠ LED and Status ☑ LED, on the back of the Controller, will flash for one minute.

Managing the Enclosure

Enclosure Management includes the following functions:

- Viewing Enclosure Information (page 158)
- Viewing Power Supply Status (page 158)
- Locating a Power Supply (page 159)
- Viewing Blower Status (page 159)
- Viewing Voltage Sensor Status (page 159)
- Viewing Temperature Sensor Status (page 159)
- Setting Temperature Thresholds (page 160)
- Checking the Batteries (page 160)
- Reconditioning a Battery (page 161)
- Locating an Enclosure (page 161)
- Viewing Enclosure Topology (page 161)

Viewing Enclosure Information

Enclosure Management includes information, status, settings and location. To access Enclosure Management:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.

To access FPU VPD information (vital product data on field replaceable units), highlight *FPU VPD Information* and press Enter.

To access the current status of the power supplies, blowers, temperature or voltage sensors, highlight the item you want and press Enter.

Viewing Power Supply Status

To view the status of the power supplies:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Power Supplies* and press Enter.

The screen displays the operational and fan status of VTrak's two power supplies. If any status differs from normal or the fan speed is below the Healthy Threshold value, there is a fan/power supply malfunction. See "Replacing a Power Supply" on page 218.

Locating a Power Supply

To locate a power supply:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Power Supplies* and press Enter.
4. Highlight *Locate Power Supply* and press Enter.

   The LED on the selected power supply blinks for one minute.

Viewing Blower Status

To view the status of the blowers:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Blowers* and press Enter.

The screen displays the status and speed of VTrak's blowers. There is one blower in each cooling unit. If blower speed is below the Healthy Threshold, there is a blower malfunction. See "Replacing a Cooling Unit Fan or Blower" on page 219.

Viewing Voltage Sensor Status

To view the status of the voltage sensors:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Voltage Sensors* and press Enter.

If any voltage is outside the Healthy Threshold values, there is a voltage malfunction in the enclosure. See "Chapter 8: Troubleshooting" on page 261.

Viewing Temperature Sensor Status

To view the status of the temperature sensors:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight E*nclosure Management* and press Enter.
3. Highlight *Temperature Sensors* and press Enter.

If any temperature exceeds the Healthy Threshold value, there is an overheat condition in the enclosure. See "Setting Temperature Thresholds" on page 160 and "Chapter 8: Troubleshooting" on page 261.

Setting Temperature Thresholds

To change temperature thresholds:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Enclosure Settings* and press Enter.
4. Highlight the Temperature Warning threshold you want to change.
5. Press the backspace key to erase the current value.
6. Type a new interval value in degrees C.
7. Press Ctrl-A to save your settings.

Checking the Batteries

This feature enables you monitor and recondition the subsystem battery or batteries.

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Batteries* and press Enter.
4. Highlight the battery you want to monitor and press Enter.

Battery Notes

Each battery works with a controller. If the battery is present in the subsystem but the corresponding controller is not present, the battery will not appear in the interface.

If a battery does not reflect normal conditions and it is not currently under reconditioning, run the Recondition function before you replace the battery. See “Reconditioning a Battery” on page 161.

Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 156.

If a battery reaches the threshold temperature while charging or discharging, the charge or discharge pauses and the blower runs at high speed until the battery temperature falls below the threshold.

If the battery does not maintain normal values after a Recondition, replace the battery. See “Replacing a Cache Battery” on page 224.

VTrak automatically reconditions the battery every two months.

When you install a new battery, the cycle count shows 0. VTrak automatically runs a recondition on the battery to verify it. If you restart the subsystem or

controller before reconditioning is finished, the battery is charged to 100%, then reconditioning starts again.

Reconditioning a Battery

To recondition the subsystem battery:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Batteries* and press Enter.
4. Highlight the battery you want to recondition and press Enter.
5. Highlight *Start Reconditioning* and press Enter.
6. Press Y to confirm.

   Reconditioning fully discharges, then fully recharges the battery. During reconditioning, if the Adaptive Writeback Cache function is enabled, the controller cache is set to *Write Thru*. After reconditioning, the cache is reset to *Write Back*. See “Making Controller Settings” on page 156.

Locating an Enclosure

This feature helps you identify the physical VTrak enclosure you are working with through the CLU.

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Management* and press Enter.
3. Highlight *Locate Enclosure* and press Enter.

   The LEDs on the front of the VTrak will blink for one minute.

Viewing Enclosure Topology

This feature displays the connection topology of the VTrak subsystem. Topology refers to the manner in which the data paths among the enclosures are connected. There are three methods:

- Individual Subsystem
- JBOD Expansion – Managed through one subsystem or head unit
- RAID Subsystem Cascading – Managed through one subsystem or head unit

For more information, see “Making Management and Data Connections” on page 21.

To view enclosure topology:

1. From the Main Menu, highlight *Subsystem Management* and press Enter.
2. Highlight *Enclosure Topology* and press Enter.

Managing Physical Drives

Physical Drive Management includes the following functions:

- Making Global Physical Drive Settings (page 162)
- Setting an Alias (page 163)
- Viewing Advanced Information (page 163)
- Viewing Physical Drive Statistics (page 163)
- Clearing Stale and PFA Conditions (page 163)
- Forcing a Physical Drive Offline or Online (page 164)
- Locating a Physical Drive (page 164)

Making Global Physical Drive Settings

All physical drive settings are made globally, except for setting an alias, which applies to individual drives.

To make global physical drive settings:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight *Global Physical Drives Settings* and press Enter.
3. Change the following settings as required.

   For SATA drives:

   - Highlight *Write Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Read Look Ahead Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *CmdQueuing* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *DMA Mode* and press the spacebar to toggle through UDMA 0–5 and MDMA 0–2.

   For SAS drives:

   - Highlight *Write Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Read Look Ahead Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *CmdQueuing* and press the spacebar to toggle between *Enabled* and *Disabled*.
   - Highlight *Read Cache* and press the spacebar to toggle between *Enabled* and *Disabled*.
4. Press Ctrl-A to save your settings.

Setting an Alias

An alias is optional. To set an Alias for a physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Type an alias into the Alias field.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
4. Press Ctrl-A to save your settings.

Viewing Advanced Information

To view advanced information about the selected physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Advanced Information* and press Enter.

Viewing Physical Drive Statistics

To view the statistics for the selected physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Physical Drive Statistics* and press Enter.

Clearing Stale and PFA Conditions

The Clear Stale and Clear PFA functions only appear when those conditions exist on the physical drive. To clear a Stale or PFA condition on a physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight the physical drive of your choice and press Enter.
3. Highlight *Clear Stale* or *Clear PFA* and press Enter.

If a physical drive is still online and shows a PFA error but “Clear PFA” does not appear, use PDM to copy the data to a new physical drive. Go to Disk Array Info and Settings.

If a physical drive is offline and shows a PFA error, rebuild the disk array. Go to Disk Array Info and Settings. After rebuilding, the drive will show Stale. Run Clear Stale then run Clear PFA.

If the physical drive with a PFA error is a spare, you must delete the drive as a spare, then Clear PFA will be available.

After you clear a PFA error, watch for another PFA error to appear. If it does, replace the physical drive.

Forcing a Physical Drive Offline or Online

This function enables you to force an:

- Online physical drive to go Offline
- Offline physical drive to go Online

The Force Offline/Online function appears only for physical drives that are assigned to disk arrays.

Caution

Forcing a physical drive offline or online is likely to cause data loss. Back up your data before you proceed. Use these functions only when required.

To force a physical drive offline or online:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight *Global Physical Drives Settings* and press Enter.
3. Highlight the physical drive of your choice and press Enter.
4. Highlight *Force Offline* or *Force Online* and press Enter.
5. Press Y to confirm.

Locating a Physical Drive

This feature helps you identify a physical drive within the VTrak enclosure you are working with through the CLU. To locate a physical drive:

1. From the Main Menu, highlight *Physical Drive Management* and press Enter.
2. Highlight *Global Physical Drives Settings* and press Enter.
3. Highlight the physical drive of your choice and press Enter.
4. Highlight *Locate Physical Drive* and press Enter.

   The drive carrier LEDs on the front of the VTrak will blink for one minute.

Managing Disk Arrays

Disk Array Management includes the following functions:

- Creating a Disk Array (page 165)
- Deleting a Disk Array (page 169)
- Viewing Disk Array Information (page 170)
- Setting an Alias for a Disk Array (page 170)
- Enabling Media Patrol on a Disk Array (page 171)
- Enabling PDM on a Disk Array (page 171)
- Preparing the Disk Array for Transport (page 171)
- Rebuilding a Disk Array (page 172)
- Migrating a Disk Array (page 172)
- Running PDM (page 173)
- Running Transition on a Disk Array (page 173)
- Locating a Disk Array (page 174)
- Locating a Disk Array (page 174)
- Creating a Logical Drive (page 174)
- Deleting a Logical Drive (page 175)

Creating a Disk Array

The CLU provides three methods of creating a disk array:

- **Automatic** – Creates a default disk array and logical drive based on unconfigured physical drives in the system. No user choices. See “Creating a Disk Array – Automatic” on page 166.
- **Express** – You select the RAID characteristics and type of application. Creates a disk array and logical drive(s) based on your input. See “Creating a Disk Array – Express” on page 167.
- **Advanced** – You specify all parameters for a new disk array. One logical drive will be made automatically when you create the disk array. If you select less than the total available capacity, you can use the remaining space to create additional logical drives at a later time. See “Creating a Disk Array – Advanced” on page 168.

Creating a Disk Array – Automatic

To create a disk array using the Automatic feature:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight *Create New Array* and press Enter.
3. Highlight *Configuration Method* and press the spacebar to toggle to *Automatic*.
4. Review the proposed configuration of disk array and logical drive(s).
   - To accept the proposed configuration and create the disk array and logical drive(s), highlight *Save Configuration* and press Enter.
   - To reject the proposed configuration, highlight *Cancel Array Configuration* and press Enter. You will return to the Disk Arrays Summary screen.

     To create a disk array with different characteristics, repeat the steps above specifying different parameters but choose the Express or Advanced option.

Creating a Disk Array – Express

To create a disk array using the Express feature:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight *Create New Array* and press Enter.
3. Highlight *Configuration Method* and press the spacebar to toggle to *Express*.
4. Highlight *Configuration Method* and press to spacebar to select each of the following characteristics for your disk array:
   - Redundancy
   - Capacity
   - Performance
   - Spare Drive
5. Highlight *Number of Logical Drives* and press the backspace key to erase the current value.
6. Enter the number of logical drives you want.
7. Highlight *Application Type* and press the spacebar to toggle though the applications and select the best one for your disk array.
   - File Server
   - Video Stream
   - Transaction Data
   - Transaction Log
   - Other
8. Press Ctrl-A to save your settings and move to the next screen.
9. Review the proposed configuration of disk array and logical drive(s).

   To accept the proposed configuration and create the disk array and logical drive(s), highlight *Save Configuration* and press Enter.

   To reject the proposed configuration, highlight *Cancel Array Configuration* and press Enter. You will return to the Disk Arrays Summary screen.

   To create a disk array with different characteristics, highlight *Create New Array* and press Enter. Repeat the steps above specifying different parameters.

Creating a Disk Array – Advanced

For more information on the choices below, see “Chapter 7: Technology Background” on page 231. To create a disk array using the Advanced feature:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight *Create New Array* and press Enter.
3. Highlight *Configuration Method* and press the spacebar to toggle to *Advanced*.
4. Choose whether to enable Media Patrol and PDM.
5. If you want to specify an alias to the disk array, highlight *Alias* and type a name.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
6. Highlight *Save Settings* and Continue and press Enter.
7. Highlight a physical drive you want to add to your array and press the spacebar to select it.

   Repeat this action until you have selected all the physical drives for your array.
8. Highlight *Save Settings and Continue* and press Enter.
9. If you want to specify an alias to the logical drive, highlight *Alias* and type a name.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore.
10. Highlight *RAID Level* and press the spacebar to toggle though a list of available RAID levels.
11. If you want to create multiple logical drives, highlight *Capacity*, press the backspace key to remove the current value, then type a new smaller value.
12. Highlight *Number of Axles* and press the spacebar to select the number of axles. Applies to RAID 50 and 60 only.
13. Highlight *Stripe* and press the spacebar to toggle through stripe sizes and select 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB.
14. Highlight *Sector* and press the spacebar to toggle through sector sizes and select 512 B, 1 KB, 2 KB, or 4 KB.
15. Highlight *Write Policy* and press the spacebar to toggle write cache policy between *WriteBack* and *WriteThru* (write though).
16. Highlight *Read Policy* and press the spacebar to toggle read cache policy though *ReadCache*, *ReadAhead*, and *NoCache*.
17. Highlight *Preferred Controller ID* and press the spacebar to toggle among *1*, *2*, or *Automatic*. Applies to dual-controller capable Fibre Channel models only.

18. Highlight *Save Logical Drive* and press Enter.
19. Review logical drive(s) you are about to create for your new array. Then do one of the following actions:
    - If you agree with the logical drive(s) as specified, highlight *Complete Disk Array Creation* and press Enter. A note will appear to remind you to set up LUN mapping for your new logical drive(s). Press any key to continue.
    - If you specified less than the full capacity for the logical drive in the previous screen, and you want to add another logical drive now, highlight *Create New Logical Drive* and press Enter.
    - If you do not agree with the logical drive(s), highlight *Return to Previous Screen* and press Enter to begin the process again.

Deleting a Disk Array

Caution

When you delete a disk array, you delete all the logical drives and the data they contain. Back up all important data before deleting a disk array.

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
3. Highlight *Delete Marked Arrays* and press Enter.
4. Press Y to confirm the deletion.

Viewing Disk Array Information

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.

   The information and settings screen appears.
3. Highlight any of the following and press Enter to view a list of:
   - Spare drives in this array, dedicated and global
   - Physical drives in this array
   - Logical drives in this array

Disk Array Operational Status

- OK – This is the normal state of a logical drive. When a logical drive is Functional, it is ready for immediate use. For RAID Levels other than RAID 0 (Striping), the logical drive has full redundancy.
- Synchronizing – This condition is temporary. Synchronizing is a maintenance function that verifies the integrity of data and redundancy in the logical drive. When a logical drive is Synchronizing, it will function and your data is available. However, access will be slower due to the synchronizing operation.
- Critical/Degraded – This condition arises as the result of a physical drive failure. A degraded logical drive will still function and your data is still available. However, the logical drive has lost redundancy (fault tolerance). You must determine the cause of the problem and correct it.
- Rebuilding – This condition is temporary. When a physical drive has been replaced, the logical drive automatically begins rebuilding in order to restore redundancy (fault tolerance). When a logical drive is rebuilding, it will function and your data is available. However, access will be slower due to the rebuilding operation.
- Transport Ready – After you perform a successful Prepare for Transport operation, this condition means you can remove the physical drives of this disk array and move them to another enclosure or different drive slots. After you relocate the physical drives, the disk array status will show OK.

Setting an Alias for a Disk Array

This function sets an alias for the disk array. To set an alias:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. To set an alias for this disk array, highlight *Alias* and type an alias into the field.

Maximum of 32 characters. Use letters, numbers, space between words and underscore. An alias is optional.

4. Press Ctrl-A to save your settings.

Accepting an Incomplete Array

This condition is the result of a missing physical drive. See “Incomplete Array” on page 292 before you use this function.

To accept an incomplete array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Accept Incomplete Array* and press Enter.

Enabling Media Patrol on a Disk Array

Media Patrol checks the magnetic media on physical drives.

To run Media Patrol on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Media Patrol* and press the spacebar to toggle between *Enable* and *Disable*.
4. Press Ctrl-A to save your settings.

Enabling PDM on a Disk Array

This function enables and disables Predictive Data Migration (PDM).

To enable or disable PDM:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *PDM* and press the spacebar to toggle between *Enable* and *Disable*.
4. Press Ctrl-A to save your settings.

See “Running PDM” on page 173.

Preparing the Disk Array for Transport

To run the Transport function on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.

3. Highlight *Transport* and press Enter.
4. Press Y to confirm.

Rebuilding a Disk Array

Before you can rebuild, you must have a replacement physical drive of adequate capacity or your disk array. To rebuild a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Rebuild* and press Enter.
5. Specify the source and target physical drives.
6. Highlight *Start* and press Enter.

Migrating a Disk Array

In order to migrate RAID level, you may have to add physical drives. For more information, see “RAID Level Migration” on page 252.

To migrate a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Migration* and press Enter.
5. Highlight the physical drive you want to add and press the spacebar to select it.

   Repeat this action to add more physical drives.

Notes

- You can add physical drives to a RAID 50 or 60 array but you cannot change the number of axles.
- If you add an odd number of physical drives to a RAID 10 array, it will become a RAID 1E array by default.

6. Highlight *Save Settings and Continue* and press Enter.
7. To change RAID level, Highlight the logical drive in the list and press Enter.
8. Highlight *RAID Level* and press the spacebar to toggle through the available RAID levels.
9. Optional. If you want to increase capacity, highlight *Expand Capacity* and press the spacebar to toggle to *Yes*.

10. Optional. If you want to increase capacity, highlight *Capacity*, press the backspace key to erase the current logical drive capacity and type in the new value.

    The new value must be equal or larger than the current capacity.
11. Highlight *Save Logical Drive* and press Enter.

    The screen returns to Disk Array Migration Logical Drives.
12. Highlight *Complete Disk Array Migration* and press Enter.
13. In the confirmation message, press Y to confirm.

    The screen jumps to Disk Arrays Summary.

Running PDM

Be sure PDM must be enabled. See “Enabling PDM on a Disk Array” on page 171.

To run Predictive Data Migration on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Predictive Data Migration* and press Enter.
5. Specify the source and target physical drives.
6. Highlight *Start* and press Enter.

Running Transition on a Disk Array

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare drive. For more information, see “Transition” on page 257.

In order to run Transition:

- The spare drive must be Revertible.
- You must have an unconfigured physical drive of the same or larger capacity to replace the spare drive.

To run Transition on a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Background Activities* and press Enter.
4. Highlight *Transition* and press Enter.
5. Specify the source and target physical drives.
6. Highlight *Start* and press Enter.

Locating a Disk Array

This feature helps you identify the physical drives assigned to the disk array you are working with in the CLU.

To locate a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Locate Disk Array* and press Enter.

   The drive carrier LEDs pertaining to this disk array will blink for one minute.

Creating a Logical Drive

You can create logical drives on existing disk arrays if there is available space in the array. For more information on the choices below, see “Chapter 7: Technology Background” on page 231.

To create a logical drive from an existing disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array in which you want to create a logical drive and press Enter.
3. Highlight *Create New Logical Drive* and press Enter.

   The Disk Array ID number and Maximum capacity available for the new logical drive are displayed.
4. Highlight the following parameters and press the backspace key to erase the current value:
   - Alias - Type an alias into the field, if desired. Maximum of 32 characters. Use letters, numbers, space between words and underscore.
   - Capacity - Maximum capacity shown. Enter a smaller capacity if desired.
5. Highlight the following parameters and press the spacebar to toggle though the available choices:
   - Stripe size – Press the spacebar to select: 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB
   - Sector size – Press the spacebar to select: 512 B; 1 KB, 2 KB, or 4 KB
   - Write Policy – Press spacebar to select: Write Back or Write Through
   - Read Policy – Press spacebar to select: No Cache, Read Cache, or Read Ahead Cache
6. Highlight *Preferred Controller ID* and press the spacebar to toggle among *1*, *2*, or *Automatic*. Applies to dual-controller capable Fibre Channel models only.

7. Highlight *Number of Axles* and press the spacebar to select the number of axles. Applies to RAID 50 and 60 only.
8. Press Ctrl-A to save your settings.

Note

If you did not use all of the available capacity of the disk array, you can create an additional logical drive at this point.

Deleting a Logical Drive

Caution

When you delete a logical drive, you delete all the data it contains. Back up all important data before deleting a logical drive.

To delete a logical drive from a disk array:

1. From the Main Menu, highlight *Disk Array Management* and press Enter.
2. Highlight the disk array that contains the logical drive you want to delete and press Enter.
3. Highlight the logical drive you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
4. Highlight *Delete Marked Logical Drives* and press Enter.
5. Press Y to confirm the deletion.

Managing Logical Drives

The Logical Drive Management function deals with settings and functions of existing logical drives. To create or delete a logical drive, see “Managing Disk Arrays” on page 165. Logical drive management includes:

- Viewing Logical Drive Information (page 176)
- Setting an Alias for a Logical Drive (page 176)
- Setting Write Cache Policy (page 176)
- Setting Read Cache Policy (page 177)
- Setting Preferred Controller ID (page 177)
- Initializing a Logical Drive (page 177)
- Running Redundancy Check (page 178)
- Locating a Logical Drive (page 178)

Viewing Logical Drive Information

To view logical drive information:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.

   The information and settings screen appears.
3. Highlight any of the following and press Enter to view more information:
   - Check Table – Read Check, Write Check, and Inconsistency Check Tables
   - Logical Drive Statistics

Setting an Alias for a Logical Drive

To set an alias for a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. To set an alias for this disk array, highlight *Alias* and type an alias into the field.

   Maximum of 32 characters. Use letters, numbers, space between words and underscore. An alias is optional.
4. Press Ctrl-A to save your settings.

Setting Write Cache Policy

To set write cache policy on a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.

2. Highlight the logical drive you want and press Enter.
3. To set write cache policy for this logical drive, highlight *WritePolicy* and press the spacebar to toggle between *WriteBack* and *WriteThru* (write though).
4. Press Ctrl-A to save your settings.

Setting Read Cache Policy

To set read cache policy on a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. To set read cache policy for this logical drive, highlight *ReadPolicy* and press the spacebar to toggle though *ReadCache*, *ReadAhead* and *None*.
4. Press Ctrl-A to save your settings.

Setting Preferred Controller ID

This feature applies to dual-controller capable Fibre Channel models only.

To set the preferred controller for this logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. To set the preferred controller ID for this logical drive, highlight *Preferred Controller ID* and press the spacebar to toggle between *1* and *2*.
4. Press Ctrl-A to save your settings.

Initializing a Logical Drive

This function sets all data bits in the logical drive to zero.

Caution

When you initialize a logical drive, you delete all the data it contains. Back up all important data before initializing a logical drive.

To initialize a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight *Background Activity* and press Enter.
4. Highlight *Start Initialization* and press Enter.

   The initialization parameters appear.

   - Initialization pattern. The default 00000000 is best for most applications

- Quick Initialization – Yes means only the first and last sections of the logical drives are initialized. No means the entire logical drive is initialized.
- Quick Initialization Size – Enter a value for the first and last sections of the logical drive to be initialized or use the default 64 MB.

To change a parameter, highlight it and press the backspace key to erase the current value, then type the new value.

5. Highlight *Start* and press Enter.

   If necessary, you can pause and resume or stop and restart the Initialization. You cannot access the logical drive until Initialization has finished.

Running Redundancy Check

Redundancy Check is a maintenance procedure for logical drives in fault-tolerant disk arrays that ensures all the data matches exactly. To run Redundancy Check:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the logical drive you want and press Enter.
3. Highlight *Background Activity* and press Enter.
4. Highlight *Start Redundancy Check* and press Enter.

   The redundancy check parameters appear.

   - Auto Fix – Corrects inconsistencies automatically
   - Pause On Error – Pauses the Redundancy Check when an error is found

   To change a parameter, highlight it and press the backspace toggle between *Yes* and *No*.
5. Highlight *Start* and press Enter.

   If necessary, you can pause and resume or stop and restart the Redundancy Check. You can use the logical drive while Redundancy Check is running.

Locating a Logical Drive

This feature helps you identify the physical drives assigned to the logical drive you are working with in the CLU. To locate a logical drive:

1. From the Main Menu, highlight *Logical Drive Management* and press Enter.
2. Highlight the disk array you want and press Enter.
3. Highlight *Locate Logical Drive* and press Enter.

   The drive status LEDs for the physical drives in this logical drive will blink for one minute.

Managing the Network Connection

Network Management deals with network connections and settings for the Management Ports. Each Management Port can be configured:

- Making Subsystem Management Port Settings (page 179)
- Making Controller Maintenance Mode Settings (page 179)

Making Subsystem Management Port Settings

The VTrak subsystem has a virtual management port. When you log into the VTrak over your network, you use the virtual management port.

Before you change settings, please see “Choosing DHCP or a Static IP Address” on page 36.

Making Automatic Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight the Virtual management port and press Enter.
3. Highlight *NetMgmt Ethernet Port Settings* and press Enter
4. Highlight *DHCP* and press the spacebar to toggle to *Enabled*.
5. Press Ctrl-A to save your settings.

Making Manual Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight the Virtual management port and press Enter.
3. Highlight *NetMgmt Ethernet Port Settings* and press Enter
4. Highlight *DHCP* and press the spacebar to toggle to *Disabled*.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
    - IP Address
    - Subnet Mask
    - Default Gateway IP Address
    - DNS Server IP Address
6. Press Ctrl-A to save your settings.

Making Controller Maintenance Mode Settings

Each RAID controller has an IP addresses for access when the controller goes into *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller. See “Controller Enters Maintenance Mode” on page 298 for more information.

Before you change settings, please see “Choosing DHCP or a Static IP Address” on page 36.

Making Automatic Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight *Maintenance Mode Network Configuration* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *DHCP* and press the spacebar to toggle to *Enabled*.
5. Press Ctrl-A to save your settings.

Making Manual Settings

1. From the Main Menu, highlight *Network Management* and press Enter.
2. Highlight *Maintenance Mode Network Configuration* and press Enter.
3. Highlight the controller you want and press Enter.
4. Highlight *DHCP* and press the spacebar to toggle to *Disabled*.
5. Highlight each of the following and press the backspace key to erase the current value, then type the new value.
   - IP Address
   - Subnet Mask
   - Default Gateway IP Address
   - DNS Server IP Address
6. Press Ctrl-A to save your settings.

Managing Fibre Channel Connections

The Fibre Channel Management option appears only with VTrak Fibre Channel models. Fibre Channel Management includes the following functions:

- Viewing Node Information (page 181)
- Viewing Fibre Channel Logged-in Devices (page 181)
- Making Fibre Channel Port Settings (page 181)
- Viewing SFP Information (page 182)
- Viewing Fibre Channel Port Statistics (page 182)
- Viewing Fibre Channel Initiators (page 183)
- Adding a Fibre Channel Initiator (page 183)

Viewing Node Information

These functions affect both VTrak Fibre Channel ports.

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Node* and press Enter.

   Node information appears. There are no user settings on this screen.

Viewing Fibre Channel Logged-in Devices

To view a list of logged-in devices:

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Ports* and press Enter.
3. Highlight *Fibre Channel Port 1* or *Port 2* and press Enter.
4. Highlight *Logged In Devices* and press Enter.

   If a Fibre Channel switch is attached, it will also appear in this list.

Making Fibre Channel Port Settings

To make Fibre Channel port settings:

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Ports* and press Enter.
3. Highlight *Fibre Channel Port 1* or *Port 2* and press Enter.
4. Highlight *Fibre Channel Port Settings* and press Enter.
5. Highlight the following parameters and press the spacebar to toggle though the choices:
   - Configured Link Speed – 1 Gb/s, 2 Gb/s, 4 Gb/s, or Automatic selection
   - Configured Topology – NL-Port (Arbitrated Loop), N-Port (Point to Point) or Automatic selection

6. Highlight *Hard ALPA* and press the backspace key to erase the current value, then type the new value.

   The range is 0 to 255. 255 disables this feature.

7. Press Ctrl-A to save your settings.

The table below shows the type of attached topology you will achieve based on your connection type and the configured topology you select:

Fibre Channel Attached Topology		
	Configured Topology	
Connection Type	N-Port	NL-Port
Switch	Fabric Direct	Public Loop
Direct	Point to Point	Private Loop

Example 1: If you connect the VTrak to a Fibre Channel switch and select NL-Port topology, you will create a Public Loop attached topology.

Example 2: If you have a Point to Point attached topology, you made a direct connection (no switch) and selected N-port topology.

Note

In some cases, HBA settings to N-Port only work if connected to the switch. Refer to your HBA manual for more information.

Viewing SFP Information

To view information about the SFPs (small form-factor plugable transceivers):

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Ports* and press Enter.
3. Highlight *Fibre Channel Port 1* or *Port 2* and press Enter.
4. Highlight *Fibre Channel Port SFP* and press Enter.

   The screen displays information about the SFP transceiver. There are no user settings on this screen.

Viewing Fibre Channel Port Statistics

To view port statistics:

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.

2. Highlight *Fibre Channel Ports* and press Enter.
3. Highlight *Fibre Channel Port 1* or *Port 2* and press Enter.
4. Highlight *Fibre Channel Port Statistics* and press Enter.

   This screen displays statistics for this port. There are no user settings on this screen.

Viewing Fibre Channel Initiators

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Initiators* and press Enter.

   A list of initiators appears.

To create an initiator, see “Creating an Initiator” on page 193.

Adding a Fibre Channel Initiator

You must add an initiator to the VTrak’s initiator list in order to use the initiator to create a LUN for your logical drive.

To add an initiator:

1. From the Main Menu, highlight *Fibre Channel Management* and press Enter.
2. Highlight *Fibre Channel Initiators* and press Enter.
3. Highlight the initiator you want to add and press the spacebar to select it.
4. Highlight *Add Marked Initiators* and press Enter.

   The initiator is added to VTrak’s initiator list.

Managing SAS Connections

The SAS Management option appears only with VTrak Serial Attached SCSI models. SAS Management includes the following functions:

- Viewing SAS Port Information (page 184)
- Making SAS Port Settings (page 184)
- Viewing SAS Port Statistics (page 185)
- Viewing SAS Initiators (page 185)
- Adding a SAS Initiator (page 185)

Viewing SAS Port Information

There are two SAS ports on each controller. To view information about the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.

   The port information appears on the screen.

Adjustable Items

- Cable Signal Strength

See “Making SAS Port Settings” on page 184.

Making SAS Port Settings

There are two SAS ports on each controller. To make settings to the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.
4. Highlight *SAS Port Settings* and press Enter.
5. Highlight *Cable Signal Strength*, press the backspace key to erase the current value, then type in the new value.

   The range is 1 to 8. 1 is the default. Signal strength correlates to cable length in meters. Example: If you have a 2 m SAS cable, set signal strength to 2. If performance is unsatisfactory (see “Viewing SAS Port Statistics” on page 185), try settings of 1 and 3, then use the best setting for your system.
6. Press Ctrl-A to save your settings.

Viewing SAS Port Statistics

There are two SAS ports on each controller. To view information about the SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Ports* and press Enter.
3. Highlight the port you want to see and press Enter.
4. Highlight *SAS Port Statistics* and press Enter.

   The statistics for the selected port appear on the screen.

Viewing SAS Initiators

There are two SAS ports on each controller, for a total of four SAS ports. To a view a list of initiators currently logged any of the four SAS ports:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Initiators* and press Enter.

   A list of all currently logged-in initiators appears on the screen.

Adding a SAS Initiator

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN for your logical drive.

To add an initiator:

1. From the Main Menu, highlight *SAS Management* and press Enter.
2. Highlight *SAS Initiators* and press Enter.
3. Highlight the initiator you want to add and press the spacebar to select it.
4. Highlight *Add Marked Initiators* and press Enter.

   The initiator is added to VTrak's initiator list.

Managing Background Activity

Background activity refers to any of several functions that take place in the background while normal operation of the VTrak continues.

Background activities work in conjunction with disk arrays and logical drives. See “Managing Disk Arrays” on page 165 and “Managing Logical Drives” on page 176 for more information about how and when to use background activities.

Background Activity Management includes the following functions:

- Viewing Current Background Activities (page 186)
- Making Background Activity Settings (page 186)

Viewing Current Background Activities

From the Main Menu, highlight *Background Activity* and press Enter. A count of current background activities appears, including:

- Rebuild
- PDM – Predictive Data Migration
- Synchronization
- Redundancy Check
- Migration
- Transition
- Initialization
- Media Patrol

Making Background Activity Settings

1. From the Main Menu, highlight *Background Activity* and press Enter.
2. Highlight *Background Activity Settings* and press Enter.
3. Highlight following and press the spacebar to toggle between *Enabled* and *Disabled*.
    - Media Patrol – Checks the magnetic media on physical drives
    - Auto Rebuild – If there is a spare drive of adequate capacity, a critical disk array will begin to rebuild automatically. If not spare drive is available, the disk array will begin to rebuild as soon as you replace the failed physical drive with an unconfigured physical drive of equal or greater size.
4. Highlight following and press the spacebar to toggle through *Low*, *Medium*, and *High* rates:
    - Rebuild – Checks the data integrity on disk arrays
    - Migration – Change RAID level or add physical dries to disk arrays

- PDM – Looks for bad blocks on the physical drives of disk arrays
- Transition – Returns a revertible spare drive to spare status
- Synchronization – Checks the data integrity on disk arrays
- Initialization – Sets all data bits in the logical drive to zero
- Redundancy Check – Checks, reports and can correct data inconsistencies in logical drives

The rates are defined as follows:

- Low – Fewer resources to activity, more to data read/write.
- Medium – Balance of resources to activity and data read/write.
- High – More resources to activity, fewer to data read/write.

5. Highlight the following PDM trigger settings and press the backspace key to erase the current value:
   - Reassigned Block Threshold – 1 to 512 blocks
   - Error Block Threshold – 1 to 1024 blocks
6. Press Ctrl-A to save your settings.

Working with the Event Viewer

The Event Viewer displays log of subsystem events. Events are classified as:

- Runtime Events – A list of and information about the 1023 most recent runtime events recorded since the subsystem was started
- NVRAM Events – A list of and information about most important events over multiple subsystem startups. NVRAM events are stored in non-volatile memory

Working with the Event Viewer includes the following functions:

- Viewing Runtime Events (page 188)
- Clearing Runtime Events (page 188)
- Viewing NVRAM Events (page 188)
- Clearing NVRAM Events (page 189)

Viewing Runtime Events

To display Runtime Events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - Sequence number – Begins with 0 at system startup.
   - Device – Disk Array, Logical Drive, Physical Drive by its ID number.
   - Severity – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - Timestamp – Date and time the event happened.
   - Description – A description of the event in plain language.
2. Press the up and down arrow keys to scroll through the log.

Clearing Runtime Events

To clear the Runtime Event log:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *Clear Runtime Event Log* and press Enter.
3. Press Y to confirm.

Viewing NVRAM Events

This screen displays a list of and information about 63 most important events over multiple subsystem startups.

To display NVRAM events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *NVRAM Events* and press Enter.

   The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

   - Sequence number – Begins with 0 at system startup.
   - Device – Disk Array, Logical Drive, Physical Drive by its ID number.
   - Severity – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - Timestamp – Date and time the event happened.
   - Description – A description of the event in plain language.
3. Press the up and down arrow keys to scroll through the log.

Clearing NVRAM Events

To clear the Runtime Event log:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *NVRAM Events* and press Enter.
3. Highlight *Clear NVRAM Event Log* and press Enter.
4. Press Y to confirm.

Managing Spare Drives

Spare Drive Management includes the following functions:

- Viewing a list of Spare Drives (page 190)
- Creating a Spare Drive (page 190)
- Making Spare Drive Settings (page 191)
- Running Spare Check (page 191)
- Deleting a Spare Drive (page 192)

Viewing a list of Spare Drives

To view a list of spare drives:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Spare Drive Management* and press Enter.

   A list of the current spare drives appears, including the following parameters:

   - ID number
   - Operational Status
   - Physical Drive ID number
   - Configured Capacity
   - Revertible – The spare drive returns to spare status after you replace the failed drive in the disk array. See “Transition” on page 257 for more information.
   - Type – Global (all disk arrays) or Dedicated (to specified disk arrays)
   - Dedicated to Array – The array to which a dedicated spare is assigned

Creating a Spare Drive

Only unconfigured physical drives can be used to make spares. Check your available drives under Physical Drive Management. See “Managing Physical Drives” on page 162.

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Spare Drive Management* and press Enter.
3. Highlight *Create New Spare Drive* and press Enter.
4. Highlight *Physical Drive Number* and press the backspace key to erase the current value, then type the new value.

   Specify the number of the physical drive you want for your spare. The available drive numbers are in parentheses.
5. Highlight *Revertible* and press the spacebar to toggle between *Yes* and *No*.

A revertible drive can be returned to spare status after you replace the failed drive in a disk array. See “Transition” on page 257 for more information.

6. Highlight *Spare Type* and press the spacebar to toggle between *Dedicated* and *Global*.

   Dedicated means this spare drive can only be used with the specified disk arrays. Global means this spare drive can be used by any disk array.

7. If you chose Dedicated, highlight *Dedicated to Arrays* and press the backspace key to erase the current value, then type the new value.

   Specify the number(s) of the disk array(s) you want to assign your spare. The current disk arrays are listed in parentheses.

8. Press Ctrl-A to save the spare drive.

Making Spare Drive Settings

To change spare drive settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Spare Drive Management* and press Enter.

   A list of the current spare drives appears, including the following parameters:

3. Highlight the spare drive you want to change and press Enter.
4. Highlight the setting you want to change:
   - Revertible – A revertible drive can be returned to spare status after you replace the failed drive in a disk array. See “Transition” on page 257 for more information.
   - Type – Dedicated means this spare drive can only be used with the specified disk array(s). Global means this spare drive can be used by any disk array.
5. Press the spacebar to toggle between the choices.
6. For dedicated spares, type the array number the spare is assigned to.
7. Press Ctrl-A to save your settings.

Running Spare Check

To run Spare Check:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Spare Drive Management* and press Enter.

   A list of the current spare drives appears.

3. Highlight the spare drive you want to check and press Enter.

4. Highlight *Start Spare Check* and press Enter.
   The results appear next to Spare Check Status.

Deleting a Spare Drive

Caution

If the spare drive you delete is the only spare, the controller will not rebuild a critical array until you provide a new spare drive.

1. Highlight the spare drive you want to delete and press the spacebar to mark it.
   The mark is an asterisk (*) to the left of the listing.
2. Highlight *Delete Marked Spare Drives* and press Enter.
3. Press Y to confirm the deletion.

Working with LUN Mapping

LUN Mapping includes the following functions:

- Viewing a List of Initiators (page 193)
- Enabling LUN Mapping (page 193)
- Creating an Initiator (page 193)
- Mapping a LUN to an Initiator (page 194)
- Deleting an Initiator (page 194)

Viewing a List of Initiators

LUN Mapping must be enabled in order for VTrak to recognize a Fibre Channel or SAS initiator. To view a list of initiators:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.

   A list of the current initiators appears.

Enabling LUN Mapping

To enable LUN mapping:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.

   A list of the current Fibre Channel or SAS initiators appears.

LUN Mapping must be enabled in order for VTrak to recognize the initiator. If LUN Mapping is currently disabled, highlight *Enable LUN Mapping* and press Enter.

Creating an Initiator

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN. You can also add initiators under Fibre Channel Management see page 183 or SAS Management, see page 185.

To create (add) a new initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight *Create New Initiator* and press Enter.
4. Type the name of the initiator.

- Fibre Channel – A Fibre Channel initiator name is the World Wide Port Name of the device and is composed of a series of eight, two-digit hexadecimal numbers.
- SAS – A SAS initiator name is the SAS address of the HBA card in the Host PC. Obtain the initiator name from the initiator utility on your host system.

Obtain the initiator name from the initiator utility on your host system.

Note that the initiator name you input must match exactly in order for the connection to work.

5. Press Ctrl-A to save the initiator.

Note

LUN Mapping must be enabled in order for VTrak to recognize the initiator.

Mapping a LUN to an Initiator

You must add an initiator to the VTrak's initiator list in order to use the initiator to create a LUN. You can add initiators under Fibre Channel Management see page 183, under SAS Management, see page 185, or under "Creating an Initiator" on page 193.

To map a LUN to an initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight an existing Initiator and press Enter.

   A list of logical drives displays.
4. In the LUN field, press the backspace key to erase the current value, then type the LUN you want to assign to this initiator, from 0 to 255.

   If you make a error, press Ctrl-R to restore the current LUN.
5. Press Ctrl-A to save the LUN map.

Deleting an Initiator

To delete an initiator:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *LUN Mapping* and press Enter.
3. Highlight the initiator you want to delete and press the spacebar to mark it.

The mark is an asterisk (*) to the left of the listing.

4. Highlight *Delete Marked Initiators* and press Enter.
5. Press Y to confirm the deletion.

Managing Users

User Management includes the following functions:

- Viewing User Information (page 196)
- Creating a User (page 196)
- Changing a User's Password (page 197)
- Changing a User's Display Name and Email Address (page 197)
- Changing a User's Privilege and Status (page 198)
- Deleting a User (page 198)

Viewing User Information

Each user types their user name and password to log into the CLI.

To view a list of current user accounts:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.

   A list of the current users appears.

Creating a User

To create a new user account:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.
3. Highlight *Create New User* and press Enter.
4. Highlight each field and type in the appropriate information:
   - User name (no spaces)
   - Password (Optional. Maximum 32 characters. Use letters, numbers, space between words and underscore)
   - Display name (Optional)
5. Highlight *Privilege* and press the space bar to toggle though the options:

   For definitions of each privilege level, see the List of User Privileges below.
6. Highlight *Status* and press the space bar to toggle between the options:
   - Enabled – Allows the user to log in to the system
   - Disabled – Prevents the user from logging in to the system
7. Press Ctrl-A to save the user.

List of User Privileges

- **View** – Allows the user to see all status and settings but not to make any changes
- **Maintenance** – Allows the user to perform maintenance tasks including Rebuilding, PDM, Media Patrol, and Redundancy Check
- **Power** – Allows the user to create (but not delete) disk arrays and logical drives, change RAID levels, change stripe size; change settings of components such as disk arrays, logical drives, physical drives, and the controller.
- **Super** – Allows the user full access to all functions including create and delete users and changing the settings of other users, and delete disk arrays and logical drives. The default “administrator” account is a Super User.

Changing a User’s Password

Each user can change their own password. A Super user can change other user’s passwords. To change a user’s password:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.
3. Highlight a User in the list and press Enter.
4. Highlight *Change Password...* and press Enter.
5. Highlight *New Password* and type the password.
6. Highlight *Retype Password* and type the password again to verify.
7. Press Ctrl-A to save the password.

Changing a User’s Display Name and Email Address

Each user can change their display name and email address. To change a display name or email address:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *User Management* and press Enter.
3. Highlight a User in the list and press Enter.
4. Highlight *Display Name* and press Enter.
5. Highlight the items you want and press the backspace key to erase the current value, then type the new value:
    - User name
    - Email address
6. Press Ctrl-A to save the settings.

Changing a User's Privilege and Status

No user can change their own privilege or status. To change another user's privilege or status.

1. Log in as the Administrator or a Super user.
2. From the Main Menu, highlight *Additional Info and Management* and press Enter.
3. Highlight *User Management* and press Enter.
4. Highlight a User in the list and press Enter.
5. Highlight *Display Name* and press Enter.
6. Highlight *Privilege* and press the space bar to toggle though the options:

   For definitions of each privilege level, see "List of User Privileges" on page 197.
7. Highlight *Status* and press the space bar to toggle between the options:
   - Enabled – Allows the user to log in to the system
   - Disabled – Prevents the user from logging in to the system
8. Press Ctrl-A to save the settings.

Deleting a User

To delete a user:

1. Log in under a user name other than the one you want to delete.
2. From the Main Menu, highlight *Additional Info and Management* and press Enter.
3. Highlight *User Management* and press Enter.
4. Highlight the user you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
5. Highlight *Delete Marked Users* and press Enter.
6. Press Y to confirm the deletion.

Working with Software Management

Software Management includes the following functions:

- Making Email Settings (page 199)
- Making SLP Settings (page 200)
- Making Webserver Settings (page 200)
- Making Telnet Settings (page 201)
- Making SNMP Settings (page 201)
- Managing SNMP Trap Sinks (page 202)
- Making CIM Settings (page 203)
- Making Netsend Settings (page 203)
- Managing Netsend Recipients (page 204)

Making Email Settings

By default, Email service is set to Automatic and its normal status is Started.

To make Email service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Email* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - Server IP address
   - Server Port number – 25 is the default
6. Highlight *Authentication* and press the spacebar to toggle between *Yes* and *No*.

   If you selected Yes, type in a User name and Password in the fields provided.
7. The following items are optional but recommended. Highlight and press the backspace key to erase the current value, then type the new value:
   - Sender's email address
   - Subject Line for the email message
8. Press Ctrl-A to save your settings.

To start, stop or restart the Email service, highlight *Start*, *Stop* or *Restart* and press Enter.

Making SLP Settings

By default, SLP service is set to Automatic and its normal status is Started.

To make SLP service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *SLP* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Press Ctrl-A to save your settings.

To start, stop or restart the SLP service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making Webserver Settings

By default, Webserver service is set to Automatic and its normal status is Started.

To make Webserver service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Webserver* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
   - HTTP Port – 80 is the default
   - Session Time Out – 24 minutes is the default. 1440 minutes = 24 hours
6. Highlight *SSL* and press the spacebar to toggle between *Enabled* and *Disabled*.
7. Highlight *HTTPS Port* and press the backspace key to erase the current value, then type the new value. 443 is the default.
8. Press Ctrl-A to save your settings.

To start, stop or restart the Webserver service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making Telnet Settings

By default, Telnet service is set to Automatic and its normal status is Started. To make Telnet service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Telnet* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
    - Port number – 2300 is the default
    - Session Time Out – 24 minutes is the default. 1440 minutes = 24 hours
    - Maximum number of connections – 4 is the default
6. Press Ctrl-A to save your settings.

To start, stop or restart the Telnet service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making SNMP Settings

By default, SNMP (Simple Network Management Protocol) service is set to Automatic and its normal status is Started.

To make SNMP service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *SNMP* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight the following and press the backspace key to erase the current value, then type the new value:
    - Port Number – 161 is the default
    - System Name – (optional) Type a system name in this field
    - System Location – Type a country name in this field
    - System Contact – Type the email address of your system administrator in this field
    - Read Community – Type a community name in this field
    - Write Community – private (no change possible)

6. Press Ctrl-A to save your settings.

To start, stop or restart the SNMP service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Managing SNMP Trap Sinks

Creating a SNMP trap sink

To create a trap sink:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *SNMP* and press Enter.
4. Highlight *Trap Sinks* and press Enter.

   A list of the current trap sinks appears.

Adding a trap sink

To add a trap sink:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Create New Trap Sink* and press Enter
4. Highlight *Trap Sink IP address* and press the backspace key to erase the current value, then type the new IP address in this field.
5. Highlight *Trap Filter* and press the spacebar to toggle through the severity levels.

   The Severity Levels are (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal.
6. Press Ctrl-A to save the Trap Sink.

Deleting a trap sink

To delete a trap sink:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight the trap sink you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing.
4. Highlight *Delete Marked Entries* and press Enter.

Making CIM Settings

By default, CIM (Common Information Model [a protocol]) service is set to Automatic and its normal status is Started.

To make CIM service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *CIM* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Highlight *HTTP* and press the spacebar to toggle between *Enabled* and *Disabled*.
6. Highlight *HTTP Port*, press the backspace key to erase, type new value.

   5988 is the default port number.
7. Highlight *HTTPS* and press the spacebar to toggle between *Enabled* and *Disabled*.
8. Highlight *HTTPS Port*, press the backspace key to erase, type new value.

   5989 is the default port number.
9. Highlight *Authentication* and press the spacebar to toggle between *Enabled* and *Disabled*.

   Note: There is only one user. The default name is **cim**. No changes are possible.

   Note: CIM service must be running to change the password.

   The default password is **password**.
10. Highlight *Change Password...* and press Enter to change the password.
11. Highlight *Old Password* and type the current password.
12. Highlight *New Password* and type a new password.
13. Highlight *Retype Password* and type the new password again.
14. Press Ctrl-A to save your settings.

To start, stop or restart the CIM service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Making Netsend Settings

By default, Netsend service is set to Manual and its normal status is Stopped.

To make Netsend service settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
3. Highlight *Netsend* and press Enter.
4. Highlight *Startup Type* and press the spacebar to toggle between *Automatic* and *Manual*.
5. Press Ctrl-A to save your settings.

To start, stop or restart the Netsend service, highlight *Start*, *Stop*, or *Restart* and press Enter.

Managing Netsend Recipients

Note that the Messenger service must be running on the recipient PC in order to receive reports.

Adding a recipient

To add a recipient:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
1. Highlight *Netsend* and press Enter.
2. Highlight *Message Recipient* and press Enter.
3. Highlight *Create New Message Recipient* and press Enter.
4. Type the recipient's IP address into the field provided.
5. Highlight *Message Event Severity Filter* and press the spacebar to change severity levels.

   The selected level and all higher severity levels of severity will be reported. Severity levels (from lowest to highest) are: Info, Warning, Minor, Major, Critical, and Fatal.
6. Press Ctrl-A to save your settings.

Changing Recipient Settings

To change recipient settings:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
1. Highlight the recipient whose settings you want to change and press Enter.
2. Type the recipient's IP address into the field provided.

3. Highlight *Message Event Severity Filter* and press the spacebar to change severity levels.
4. Press Ctrl-A to save your settings.

Deleting a Recipient

To delete a recipient:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Software Management* and press Enter.
1. Highlight the recipient you want to delete and press the spacebar to mark it.

   The mark is an asterisk (*) to the left of the listing
2. Highlight *Delete Marked Entries* and press Enter.

NetSend Requirements

In order to use NetSend:

- NetSend must be running the VTrak
- You must provide the IP address for each recipient PC
- The Messenger service must be running on each recipient PC

If your NetSend and Messenger service settings are correct but the recipient PC does not receive event messages, check the recipient PC's Firewall settings. Refer to your OS documentation for more information.

Flashing through TFTP

Use this function to flash the VTrak's firmware. See "Updating the Firmware in the CLU" on page 216 for this procedure.

Clearing Statistics

This function clears the statistical counts for the RAID controller, Fibre Channel ports, SAS ports, physical drives, and logical drives. To clear statistics:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Clear Statistics* and press Enter.
3. Press Y to confirm the deletion.

Restoring Factory Defaults

This function restores the factory default settings to the firmware and software items you select.

Caution

Use this function with care. Do not restore to default settings for any item unless you are sure this action is needed.

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Restore Factory Defaults* and press Enter.
3. Highlight the setting group you want and press the spacebar to toggle between *Yes* and *No*.

   Yes means this setting will be restored to the default value.
4. Highlight *Restore Factory Defaults* and press Enter.
5. Press Y to confirm the reset.

Shutting Down the Subsystem

There are two methods for shutting down the subsystem. Choose one of the following procedures:

- Shutting down the VTrak – Telnet Connection (page 209)
- Shutting down the VTrak – Serial Connection (page 209)

Shutting down the VTrak – Telnet Connection

This function enables you to shutdown the VTrak subsystem on a Telnet connection. You can only do part of this procedure in the CLU. Additional action is required, as described below. To shutdown the VTrak:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Shutdown or Restart* and press Enter.
4. Highlight *Option* and press the spacebar to display *Restart*.
5. Highlight *Submit* and press Enter.

   A warning message appears.
6. Press Y to continue.

   The screen will go blank.
7. Wait for no less than two minutes.
8. Manually turn off the power supply switches on the back of the subsystem.

Shutting down the VTrak – Serial Connection

This function enables you to shutdown the VTrak subsystem on a serial connection. You can only do part of this procedure in the CLU. Additional action is required, as described below. To shutdown the VTrak:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Shutdown or Restart* and press Enter.
4. Highlight *Option* and press the spacebar to display *Restart*.
5. Highlight *Submit* and press Enter.

   A warning message appears.
6. Press Y to continue.
7. Turn off the power supply switches when you see the following message:

```
Shutdown complete. It is now safe to power off
the subsystem.
```

Restarting the Subsystem

There are two methods for restarting the subsystem. Choose one of the following procedures:

- Restarting the Subsystem (page 211)
- Restarting VTrak – Serial Connection (page 211)

Restarting VTrak – Telnet Connection

This function enables you to restart the VTrak subsystem on a Telnet connection. You can only do part of this procedure in the CLU. Additional action is required, as described below. To restart the VTrak:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Option* and press the spacebar to display *Restart*.
4. Highlight *Submit* and press Enter.

   A warning message appears.
5. Press Y to continue.

   The screen will go blank.
6. Wait for no less than two minutes.
7. Re-establish your Telnet connection to the VTrak CLU.

   If you cannot re-establish a connection, wait 30 seconds, then try again.

Restarting VTrak – Serial Connection

This function enables you to restart the VTrak subsystem on a serial connection. You can only do part of this procedure in the CLU. Additional action is required, as described below. To restart the VTrak:

1. From the Main Menu, highlight *Additional Info and Management* and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Highlight *Option* and press the spacebar to display *Restart*.
4. Highlight *Submit* and press Enter.

   A warning message appears.
5. Press Y to continue.

   The screen will display shutdown and startup functions.
6. When the `Login:` prompt appears, log into the CLU again.

Making Buzzer Settings

This function enables the buzzer on the controller. When you first power-up the VTrak, it beeps twice to show normal operation. To change buzzer settings:

1. From the Main Menu, highlight *Buzzer* and press Enter.

   A list of Controllers appears with the current buzzer setting and status.
2. Highlight the Controller whose buzzer you want to set and press Enter.
3. Highlight *Enabled* and press the spacebar to toggle between *Yes* and *No*.
4. Press Ctrl-A to save your settings.

The buzzer provides the audible alarm. See “VTrak is Beeping” on page 262.

Chapter 6: Maintenance

This chapter covers the following topics:

- Updating the Firmware in WebPAM PROe (page 213)
- Updating the Firmware in the CLU (page 216)
- Replacing a Power Supply (page 218)
- Replacing a Cooling Unit Fan or Blower (page 219)
- Replacing a Cache Battery (page 224)
- Replacing a RAID Controller (page 228)

Updating the Firmware in WebPAM PROe

A firmware update consists of the following actions:

- Downloading the Firmware Image File (page 213)
- Updating Firmware from TFTP Server (page 213) or Updating Firmware from your PC (page 214)
- Restarting the Subsystem (page 215)

Downloading the Firmware Image File

Go to the Promise website at http://www.promise.com/support and download the latest firmware image (.img) file to your TFTP server or your PC. The firmware update image file includes all of the files for the VTrak, including:

- Firmware
- Software
- Kernel
- RedBoot
- Other files

Updating Firmware from TFTP Server

To update the firmware from a TFTP server:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click on the Software Management icon.
4. Click on the Firmware Update tab.
5. Do one of the following actions:
   - Click on the Download from TFTP Server option, then click on the **Next** button.

- From the Firmware Update tab dropdown menu, select *Download from TFTP Server*.

6. Enter the hostname or IP address of your TFTP server in the field provided.
7. Enter the port number of your TFTP server in the field provided (69 is the default).
8. Enter the filename of the Firmware Update file in the field provided.
9. Click the **Submit** button.
10. When the download is completed, click the **Next** button.

    A popup message appears warning you not to reboot the VTrak during the firmware update procedure.
11. In the popup message, click the **OK** button.

    The update progress displays. Then a popup message appears to tell you to reboot the VTrak.
12. In the popup message, click the **OK** button.
13. Restart the VTrak. See “Restarting the Subsystem” on page 215.

Note

After you click the **Submit** button, if WebPAM PROe displays this message: **error transferring image**, you entered an incorrect file name or an incorrect location. Check the information and try again.

Updating Firmware from your PC

To update the firmware from your PC:

1. Click the Subsystem icon in Tree View.
2. Click the Administrative Tools icon.
3. Click on the Software Management icon.
4. Click on the Firmware Update tab.
5. Do one of the following actions:
   - Click on the Download Flash File from Local File through HTTP option, then click on the Next button.
   - From the Firmware Update tab dropdown menu, select *Download from Local File*.
6. Enter the filename of the Firmware Update file in the field provided.

   Or, click the **Browse...** button and select the Firmware Update file in the Open dialog box.
7. Click the **Submit** button.

8. When the download is completed, click the **Next** button.

   A popup message appears to warn you not to reboot the VTrak during the firmware update procedure.

9. In the popup message, click the **OK** button.

   The update progress displays. Then a popup message appears to tell you to reboot the VTrak.

10. In the popup message, click the **OK** button.
11. Restart the VTrak. See “Restarting the Subsystem” on page 215.

Note

After you click the **Submit** button, if WebPAM PROe displays this message: **error transferring image**, you entered an incorrect file name or an incorrect location. Check the information and try again.

Restarting the Subsystem

Warning

Do not restart the VTrak during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the VTrak subsystem:

1. Click on the Subsystem icon in Tree View.
2. Click on the Administrative Tools icon.
3. Click on the Shutdown link in Management View.

   A Shutdown or Restart tab will appear.

4. On the Shutdown or Restart tab, select *Restart* from the dropdown menu.
5. Click the **Submit** button.
6. In the warning box, click the **OK** button.
7. In the confirmation box, type the word **confirm** in the field provided.
8. Click the **OK** button.

   When the controller shuts down, your WebPAM PROe connection will be lost.

9. Wait for two to three minutes.
10. In your browser, log into WebPAM PROe once again.

    If you cannot log in, wait for 30 seconds, and try again. Repeat until login is successful.

Updating the Firmware in the CLU

A firmware update consists of the following actions:

- Downloading the Firmware Image File (page 216)
- Updating the Firmware (page 216)
- Restarting Subsystem over a Telnet Connection (page 216)
- Restarting Subsystem over a Serial Connection (page 217)

Downloading the Firmware Image File

Go to the Promise website at http://www.promise.com/support and download the latest firmware image file to your TFTP server.

Updating the Firmware

To update the firmware file in the CLU:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Flash through TFTP* and press Enter.
3. Highlight *TFTP Server* and type the IP address of your TFTP server in the field provided.
4. Highlight *Port Number* and press the backspace key to erase the current value, then type the new value. 69 is the default.

   A list of the current users appears.
5. Highlight *File Name* and type the file name of the firmware image file in the field provided.
6. Highlight *Start* and press Enter.

   A message appears to tell you to reboot the VTrak.
7. Restart the VTrak.

   See “Restarting Subsystem over a Telnet Connection” on page 216 or “Restarting Subsystem over a Serial Connection” on page 217.

Restarting Subsystem over a Telnet Connection

Warning

Do not restart the VTrak during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the VTrak subsystem on a Telnet connection:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.
4. Press Y to continue.

   The screen will go blank.
5. Wait for two to three minutes.
6. Re-establish your Telnet connection to the VTrak CLU.

   If you cannot re-establish a connection, wait 30 seconds, then try again.

Restarting Subsystem over a Serial Connection

Warning

Do not restart the VTrak during a firmware upgrade procedure. Wait until the upgrade is one and you are prompted to restart.

To restart the VTrak subsystem on a serial connection:

1. From the Main Menu, highlight *Additional Info and Management*, and press Enter.
2. Highlight *Shutdown or Restart* and press Enter.
3. Press the spacebar to display *Restart* then press Enter.

   A warning message appears.
4. Press Y to continue.

   The screen will display shutdown and startup functions.
5. When the `Login:` prompt appears, log into the CLU again.

Replacing a Power Supply

The power supply and its fans are replaced as one unit. There are no individually serviceable parts. No tools are required for this procedure.

Remove the Old Power Supply

To remove the power supply:

1. Verify that the power supply LED is amber or red.
2. Switch off the power.
3. Unplug the power cord.
4. Press the release button and pull the handle downward as shown. See Figure 1 (E610f/s) or 2 (E310f/s).
5. Pull the power supply out of the VTrak enclosure.

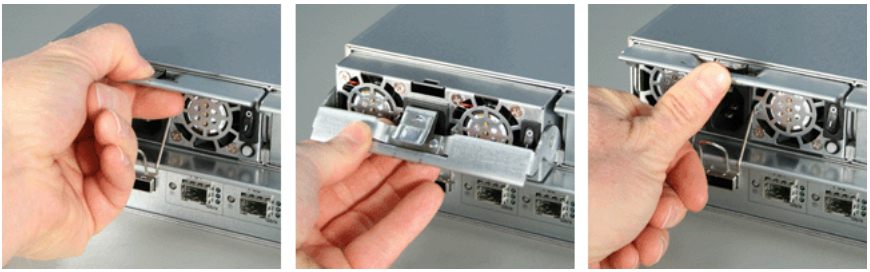
Install a New Power Supply

To install the power supply:

1. Carefully slide the power supply into the enclosure.
2. Gently press the handle in and upward until it locks. See Figure 1 (E610f/s) or 2 (E310f/s).
3. Plug in the power cord.
4. Switch on the power supply.
5. Verify that the new power supply LED is green.

Figure 1. Replacing an E610f/s power supply

Figure 2. Replacing an E310f/s power supply



This completes the power supply replacement procedure.

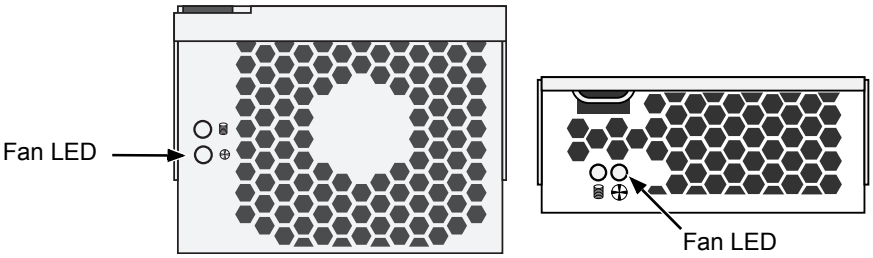
Replacing a Cooling Unit Fan or Blower

The fan or blower in each cooling unit is replaced as an individual part. No tools are required for this procedure.

To replace a fan or blower:

1. Verify that the Fan LED on the cooling unit is amber or red. See Figure 3.

Figure 3. Fan LED (left: E610f/s, right: E310f/s)



2. On the cooling unit, press the release button and pull the handle downward. See Figure 4 (E610f/s) or 5 (E310f/s).
3. Pull the cooling unit out of the VTrak enclosure.

Figure 4. Removing a cooling unit from the E610f/s

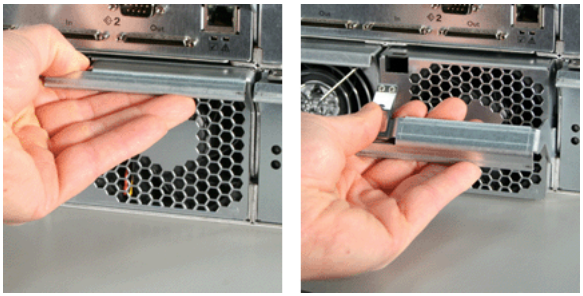
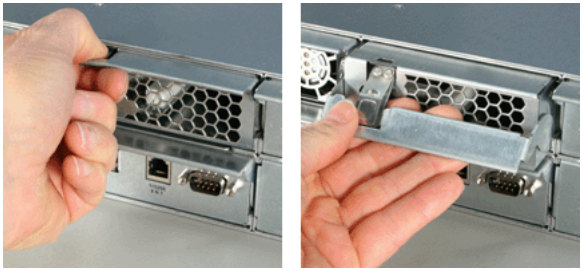


Figure 5. Removing a cooling unit from the E310f/s



4. Loosen the thumbscrews. A retainer keeps the thumbscrews in place.
5. Grasp the top section near the thumbscrews and lift it off the bottom section. Separate the cooling unit sections to access the blower. See Figure 6 (E610f/s) or 7 (E310f/s).

Figure 6. Loosen the thumbscrews and remove the cover (E610f/s)

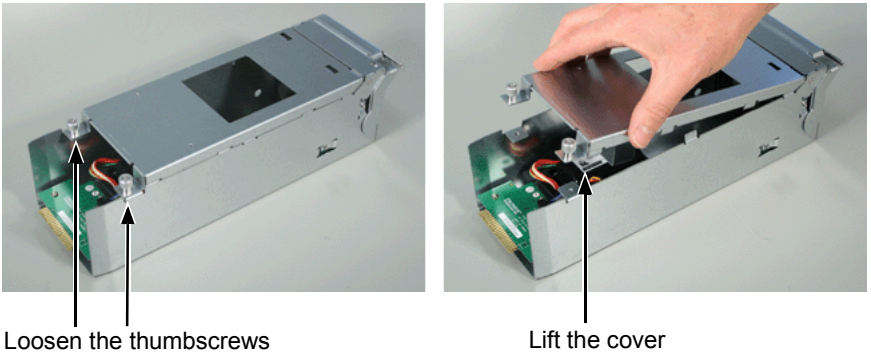
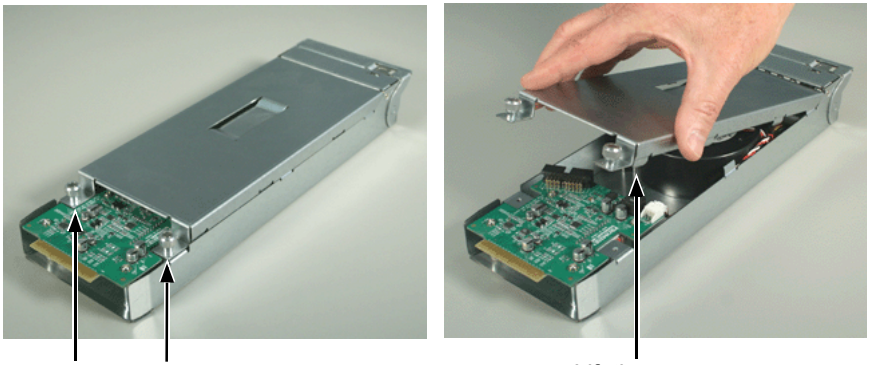


Figure 7. Loosen the thumbscrews and remove the cover (E310f/s)



6. Lift the fan or blower off the mounting pins and detach the electrical connector. See Figure 8 (E610f/s) or 9 (E310f/s).

Figure 8. The E610f/s fan and its electrical connector

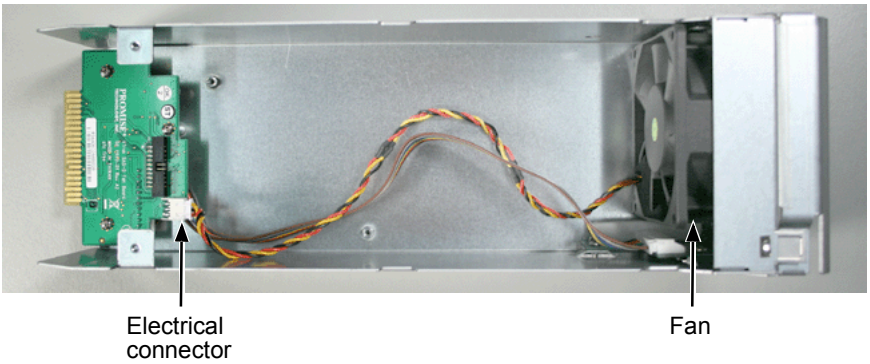
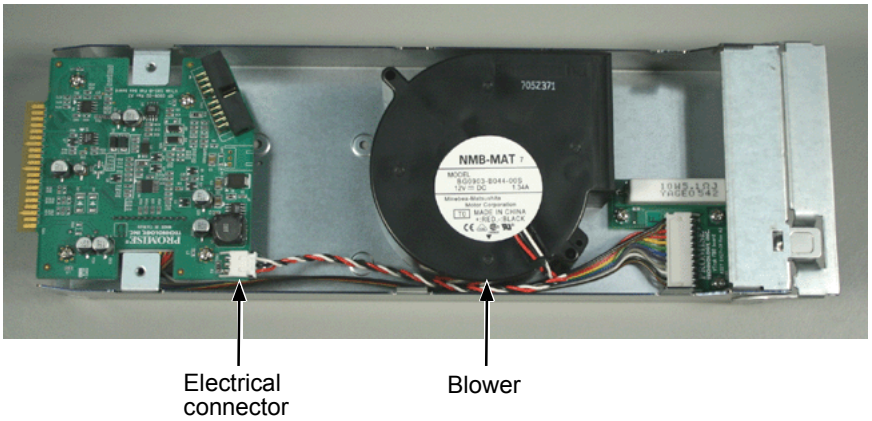


Figure 9. The E310f/s blower and its electrical connector



7. Attach the electrical connector of the new fan blower and set the fan or blower in place.

   Be sure you position the fan or blower onto the mounting pins. See Figure 10 (E610f/s) or 11 (E310f/s).

Figure 10. Position the fan onto the mounting pins, pointed outward

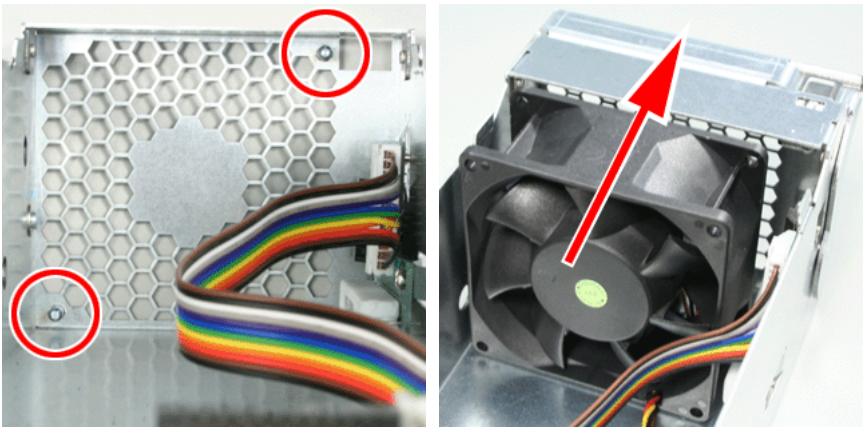
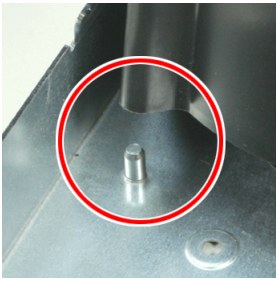


Figure 11. Positioning the blower onto the mounting pins, pointed outward



Be sure the blower points outward, towards the handle.

8. Place the top section of the cooling unit onto the bottom section and tighten the thumbscrews.
9. Carefully slide the cooling unit into the enclosure.
10. Gently press the handle in and upward until it locks. See Figure 12.

Figure 12. Locking the cooling unit handle (left: E610f/s, right: E310f/s)

11. Verify that the Fan LEDs are green.

This completes the fan replacement procedure.

Replacing a Cache Battery

The cache battery is located inside the cooling unit. The battery assembly is replaced as an individual part.

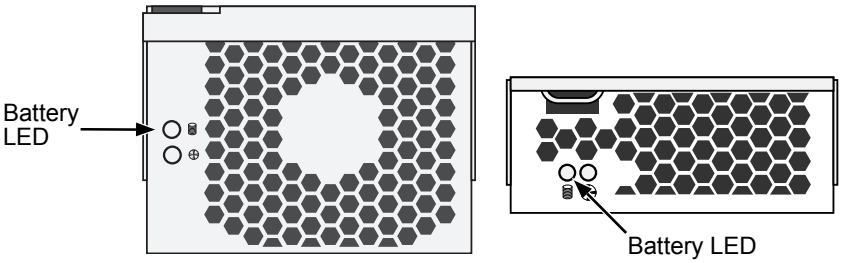
Cautions

- Try reconditioning the battery before you replace it. See page 114 or page 161 for more information.
- The battery assembly is replaced as a unit. Do not attempt to disconnect the battery by itself.
- Installing the wrong replacement battery can result in an explosion.
- Dispose of used batteries according to the instructions that accompany the battery.
- While the battery is removed, your system will be vulnerable to data loss if the power fails while data is being written to the logical drives.
- If power service has failed, do not remove the cooling unit if the Controller's Dirty Cache LED is flashing. See "Browser Does Not Connect to WebPAM PROe" on page 301.

To replace a cache battery:

1. Verify that the Battery LED is amber or red. See Figure 13.

Figure 13. Fan LED (left: E610f/s, right: E310f/s)



2. Press the release button and pull the handle downward as shown above.
3. Pull the cooling unit out of the VTrak enclosure. See Figure 14 (E610f/s) or 15 (E310f/s).

Figure 14. Removing the cooling unit from the enclosure from the E610f/s

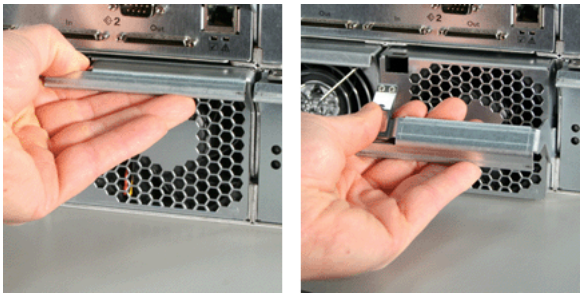
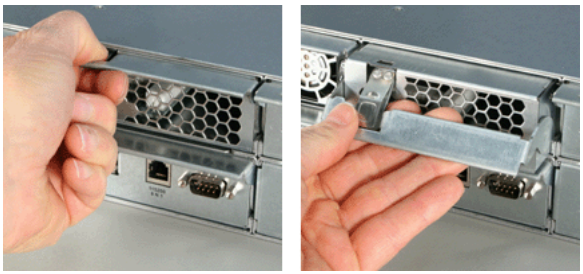


Figure 15. Removing the cooling unit from the enclosure from the E310f/s



3. Loosen the thumbscrews. A retainer keeps the thumbscrews in place.
4. Grasp the top section near the thumbscrews and lift it off the bottom section. Separate the cooling unit sections to access the battery assemble. See Figure 16 (E610f/s) or 17 (E310f/s).

Figure 16. Loosen the thumbscrews and remove the cover (E610f/s)

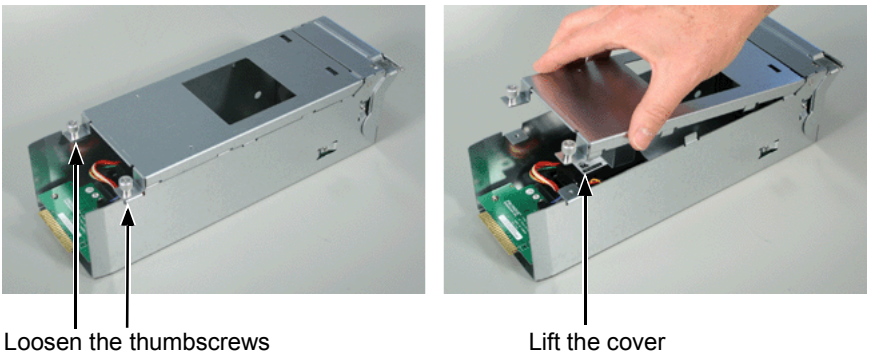
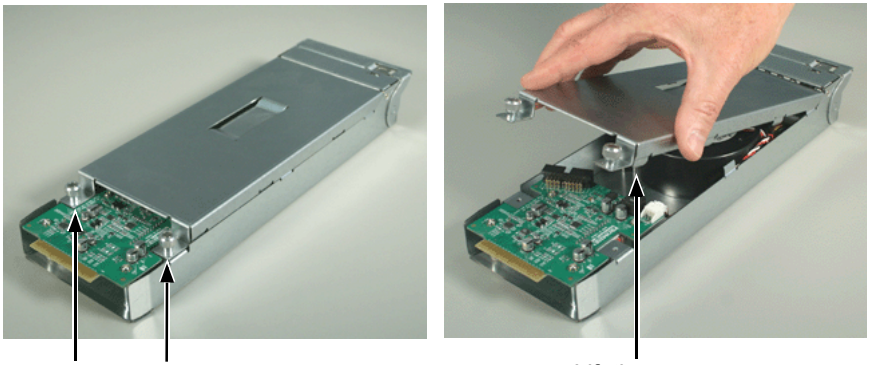


Figure 17. Loosen the thumbscrews and remove the cover (E310f/s)



5. Remove the two screws holding the battery assembly in place.
6. Detach the connector on the circuit board.

   Do not detach any other connectors. See Figure 18 (E610f/s) or 19 (E310f/s).

Figure 18. Removing the battery assembly (E610f/s)

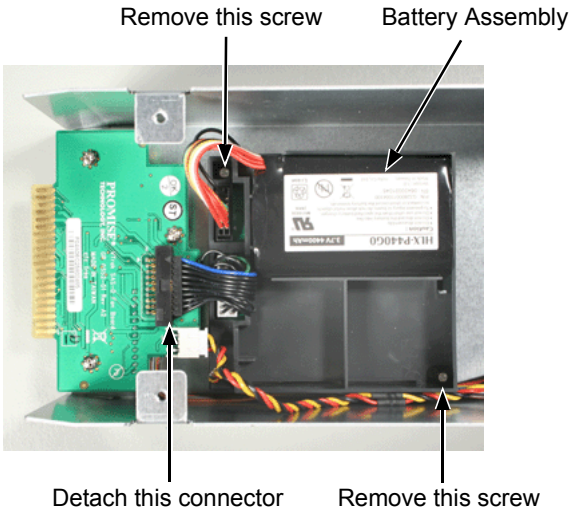
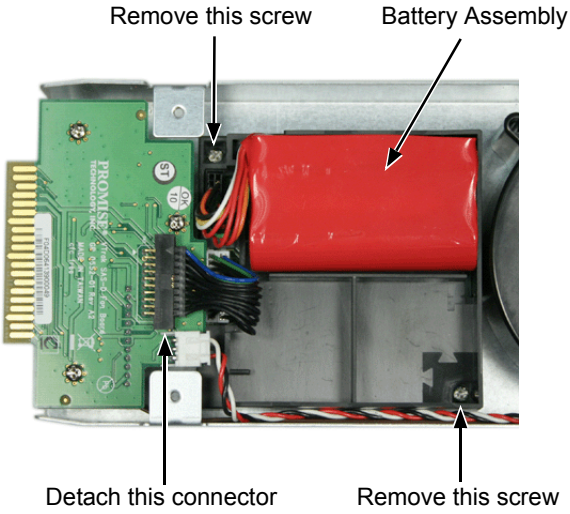


Figure 19. Removing the battery assembly (E310f/s)



7. Lift the battery assembly out of the cooling unit.
8. Place a new battery assembly into the cooling unit.
9. Attach the connector on the circuit board.
10. Install the two screws holding the battery assembly in place to the cooling unit.
11. Place the top section of the cooling unit onto the bottom section and tighten the thumbscrews.
12. Carefully slide the cooling unit into the enclosure.
13. Gently press the handle in and upward until it locks. See Figure 20.

Figure 20. Locking the cooling unit handle (left: E610f/s, right: E310f/s)

This completes the battery replacement procedure.

Replacing a RAID Controller

The RAID Controller monitors and manages the logical drives. When this controller is replaced, all of your logical drive data and configurations remain intact because this logical drive information is stored on the disk drives.

Caution

The RAID controller is NOT hot-swappable if your VTrak has only one controller. Power-down the VTrak before removing it.

If your VTrak has two RAID controllers, you can hot-swap one controller at a time.

Important

Do not replace the RAID Controller based on LED colors alone. Only replace the RAID Controller when directed to do so by Promise Technical Support. See page 305.

Dual Controller Subsystem

Before you install the replacement controller, be sure the replacement controller has:

- The same Firmware version as the original controller
- The same amount of SDRAM as the original controller

To obtain this information, click on the Controller icon, Information tab, and look for Firmware Version and Memory Size.

Removing the old controller

To remove a RAID Controller on a dual-controller subsystem:

1. Disconnect the Fibre Channel or SAS cables, management, serial, and power cables.
2. On the controller handle, press the release button and pull the handle downward. See Figure 21.
3. Pull the controller out of the VTrak enclosure.

Installing the new controller

To install the new controller:

1. Carefully slide the controller into the enclosure.
2. Gently press the handle in and upward until it locks. See Figure 21.
3. Connect the Fibre Channel or SAS cables, management, serial, and power cables.

Single Controller Subsystem

Removing the old controller

To remove the RAID Controller on a single-controller subsystem:

1. Shutdown the VTrak. See “Shutting Down the Subsystem” on page 103 (WebPAM PROe) or page 209 (CLU).
2. Switch off the power.
3. Disconnect the Fibre Channel or SAS cables, management, serial and power cables.
4. On the controller handle, press the release button and pull the handle downward. See Figure 21.
5. Pull the controller out of the VTrak enclosure.

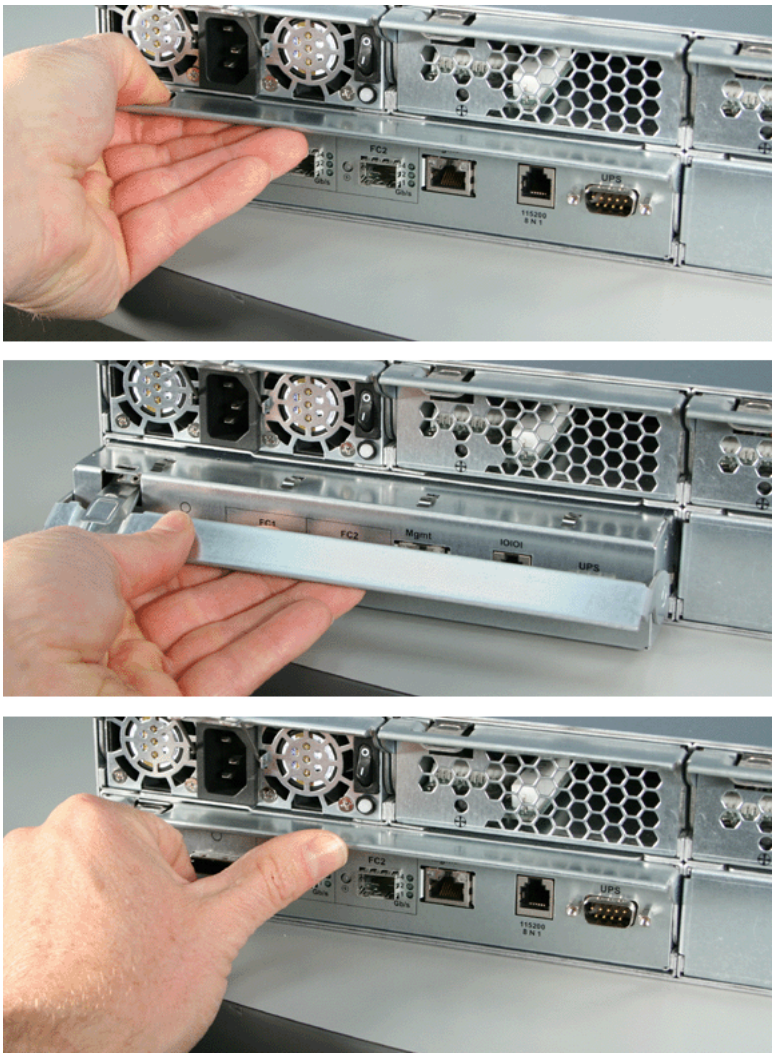
Installing the new controller

To install the new controller:

1. Carefully slide the controller into the enclosure.
2. Gently press the handle in and upward until it locks. See Figure 21.
3. Connect the Fibre Channel or SAS cables, management, serial and power cables.
4. Switch on the power.

   The VTrak will restart. For more information about VTrak’s start-up behavior, see “Connecting the Power” on page 33.

Figure 21. Replacing the controller. The E310f/s is shown. The E610f/s is similar



Chapter 7: Technology Background

This chapter covers the following topics:

- Introduction to RAID (below)
- Choosing a RAID Level (page 242)
- Choosing Stripe Size (page 245)
- Choosing Sector Size (page 245)
- Cache Policy (page 246)
- Cache Mirroring (page 248)
- LUN Affinity (page 249)
- Capacity Coercion (page 250)
- Initialization (page 251)
- Hot Spare Drive(s) (page 251)
- Partition and Format the Logical Drive (page 252)
- RAID Level Migration (page 252)
- Media Patrol (page 255)
- Predictive Data Migration (PDM) (page 256)
- Transition (page 257)

Introduction to RAID

RAID (Redundant Array of Independent Disks) allows multiple hard drives to be combined together in a disk array. Then all or a portion of the disk array is formed into a logical drive. The operating system sees the logical drive as a single storage device, and treats it as such. The RAID software and/or controller handle all of the individual drives on its own. The benefits of a RAID can include:

- Higher data transfer rates for increased server performance
- Increased overall storage capacity for a single drive designation (such as, C, D, E, etc.)
- Data redundancy/fault tolerance for ensuring continuous system operation in the event of a hard drive failure

Different types of disk arrays use different organizational models and have varying benefits. Also see “Choosing a RAID Level” on page 242. The following outline breaks down the properties for each type of RAID disk array:

RAID 0 – Stripe

When a disk array is striped, the read and write blocks of data are interleaved between the sectors of multiple drives. Performance is increased, since the workload is balanced between drives or “members” that form the disk array. Identical disk drives are recommended for performance as well as data storage efficiency. The disk array’s data capacity is equal to the number of disk drive members multiplied by the smallest drive's capacity.

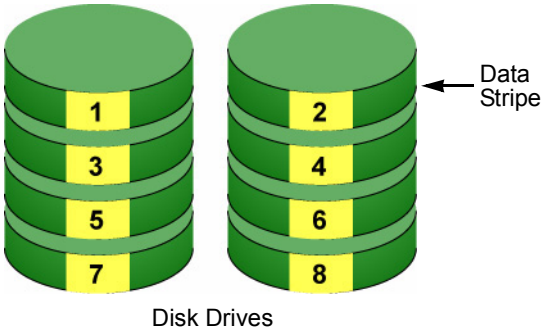


Figure 1. RAID 0 Striping interleaves data across multiple drives

For example, one 100 GB and three 120 GB drives will form a 400 GB (4 x 100 GB) disk array instead of 460 GB.

RAID 0 arrays require one or more physical drives.

Recommended applications: Image Editing, Pre-Press Applications, other applications requiring high bandwidth.

RAID 1 – Mirror

When a disk array is mirrored, identical data is written to a pair of drives, while reads are performed in parallel. The reads are performed using elevator seek and load balancing techniques where the workload is distributed in the most efficient manner. Whichever drive is not busy and is positioned closer to the data will be accessed first. With RAID 1, if one drive fails or has errors, the other mirrored drive continues to function. This is called *Fault Tolerance*. Moreover, if a spare drive is present, the spare drive will be used as the replacement drive and data will begin to be mirrored to it from the remaining good drive.

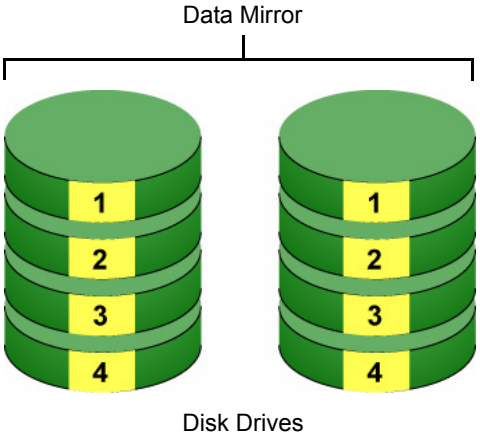


Figure 2. RAID 1 Mirrors identical data to two drives

Due to the data redundancy of mirroring, the drive capacity of the disk array is only the size of the smallest drive. For example, two 100 GB drives which have a combined capacity of 200 GB instead would have 100 GB of usable storage when set up in a mirrored disk array. Similar to RAID 0 striping, if drives of different capacities are used, there will also be unused capacity on the larger drive.

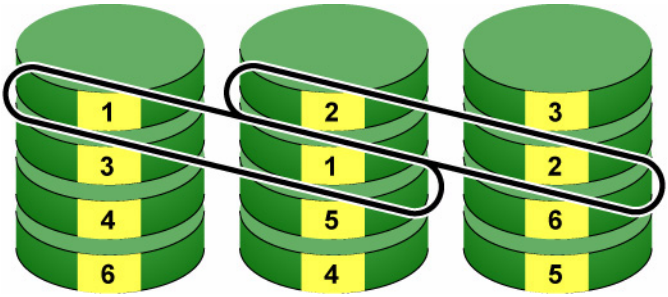
RAID 1 arrays use two physical drives. You can create multiple RAID 1 disk arrays on the same Promise product.

Recommended applications: Accounting, Payroll, Financial, other applications requiring very high availability.

RAID 1E – Enhanced Mirror

RAID 1E offers the security of mirrored data provided by RAID 1 plus the added capacity of more than two disk drives. It also offers overall increased read/write performance plus the flexibility of using an odd number of disk drives. With RAID 1E, each data stripe is mirrored onto two disk drives. If one drive fails or has errors, the other drives continue to function, providing fault tolerance.

Enhanced Data Mirrors



Disk Drives

The advantage of RAID 1E is the ability to use an odd number of disk drives, unlike RAID 1 and RAID 10. You can also create a RAID 1E Logical Drive with an even number of disk drives. However, if you have an even number of disks, you will obtain greater security with comparable performance using RAID 10.

RAID 1E arrays consist of three or more physical drives. You can create an array with just two physical drives and specify RAID 1E. But the resulting array will actually be a RAID 1.

Recommended applications: Imaging Applications, Database Servers, General Fileservers.

RAID 5 – Block and Parity Stripe

RAID 5 organizes block data and parity data across the physical drives. Generally, RAID Level 5 tends to exhibit lower random write performance due to the heavy workload of parity recalculation for each I/O. RAID 5 is generally considered to be the most versatile RAID level

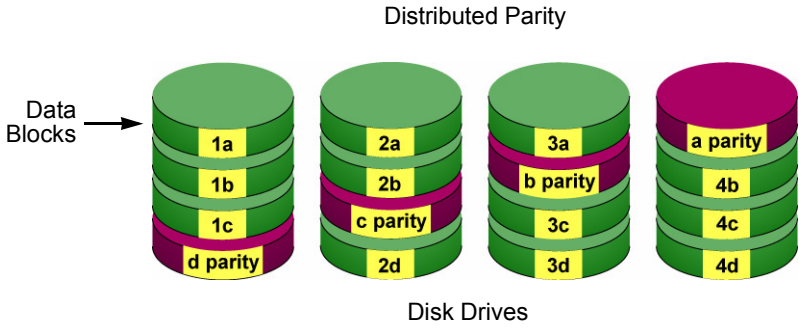


Figure 3. RAID 5 Stripes all drives with data and parity information

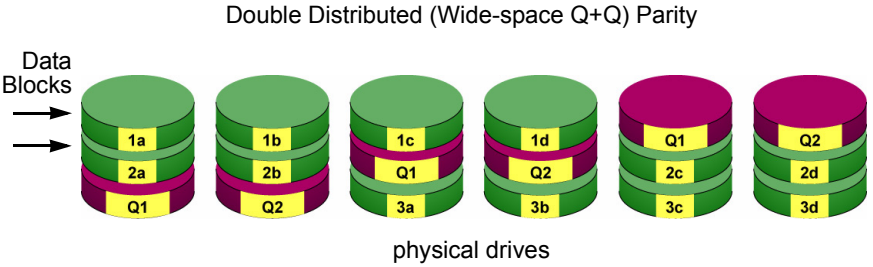
The capacity of a RAID 5 disk array is the smallest drive size multiplied by the number of drives less one. Hence, a RAID 5 disk array with four 100 GB hard drives will have a capacity of 300 GB. A disk array with eight 120 GB hard drives and one 100 GB hard drive will have a capacity of 800 GB.

RAID 5 requires a minimum of three physical drives and a maximum of 16.

Recommended applications: File and Application Servers; WWW, E-mail, News servers, Intranet Servers

RAID 6 – Block and Double Parity Stripe

RAID level 6 stores dual parity data is rotated across the physical drives along with the block data. A RAID 6 disk array can continue to accept I/O requests when any two physical drives fail.



The total capacity of a RAID 6 disk array is the smallest physical drive times the number of physical drives, minus two.

Hence, a RAID 6 disk array with six 100 GB hard drives will have a capacity of 400 GB. A disk logical drive with four100 GB hard drives will have a capacity of 200 GB.

RAID 6 becomes more capacity efficient in terms of physical drives as the number of physical drives increases.

RAID 6 offers double fault tolerance. Your logical drive remains available when up to two physical drives fail.

RAID 6 is generally considered to be the safest RAID level, except for RAID 60.

RAID 6 requires a minimum of four physical drives and a maximum of 16.

Recommended applications: Accounting, financial, and database servers; any application requiring very high availability.

RAID 10 – Mirror + Stripe

Mirroring/striping combines both of the previous RAID 1 and RAID 0 disk array types. RAID 10 is similar though not identical to RAID 0+1. RAID 10 can increase performance by reading and writing data in parallel while protecting data with duplication. At least four drives are needed for RAID 10 to be installed. With four disk drives, the drive pairs are striped together with one pair mirroring the first pair. The data capacity is similar to a RAID 1 disk array, with half of the total storage capacity used for redundancy. An added plus for using RAID 10 is that, in many situations, such a disk array offers double fault tolerance. Double fault tolerance may allow your logical drive to continue to operate depending on which two disk drives fail.

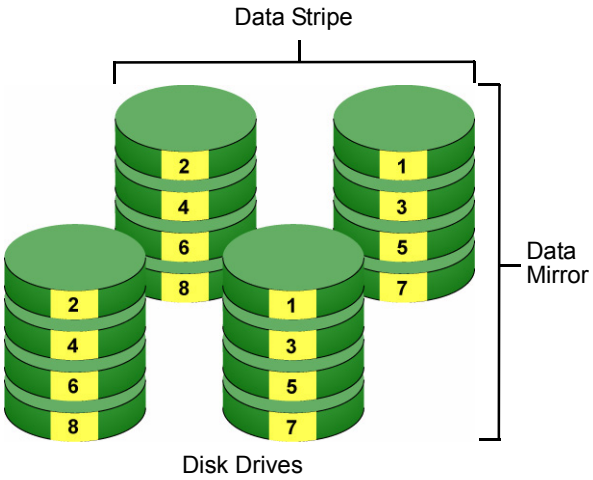


Figure 4. RAID 10 takes a data mirror on one drive pair and stripes it over two drive pairs

RAID 10 arrays require an even number of physical drives and a minimum of four.

For RAID 10 characteristics with an odd number of disk drives, use RAID 1E.

Recommended applications: Imaging Applications, Database Servers, General Fileservers.

RAID 50 – Striping of Distributed Parity

RAID 50 combines both RAID 5 and RAID 0 features. Data is striped across disks as in RAID 0, and it uses distributed parity as in RAID 5. RAID 50 provides data reliability, good overall performance and supports larger volume sizes.

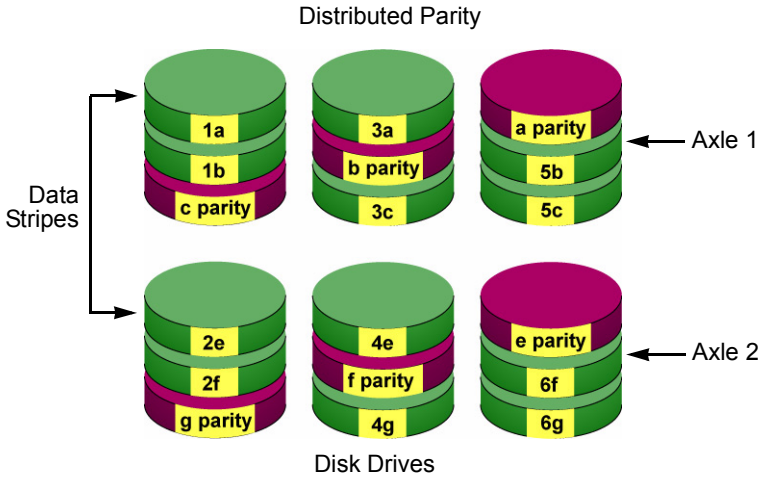


Figure 5. RAID 50 Striping of Distributed Parity disk arrays

RAID 50 also provides high reliability because data is still available even if multiple disk drives fail (one in each axle). The greater the number of axles, the greater the number of disk drives that can fail without the RAID 50 array going offline.

RAID 50 arrays consist of six or more physical drives.

Using a VTrak E610f/s or E310f/s subsystem expanded by four J300s subsystems, your RAID 50 array supports up to 60 physical drives. See “Configuring JBOD Expansion” on page 24 or page 30. However, Promise recommends that you set aside a few physical drives as hot spares. See “Hot Spare Drive(s)” on page 251.

Recommended applications: File and Application Servers, Transaction Processing, Office applications with many users accessing small files.

RAID 50 Axles

When you create a RAID 50, you must specify the number of *axles*. An axle refers to a single RAID 5 array that is striped with other RAID 5 arrays to make RAID 50. An axle can have from 3 to 16 physical drives, depending on the number of physical drives in the array.

The chart below shows RAID 50 arrays with 6 to 16 physical drives, the available number of axles, and the resulting distribution of physical drives on each axle.

RAID 50 Array		
No. of Drives	**No. of Axles**	**Drives per Axle**
6	2	3,3
7	2	3,4
8	2	4,4
9	2	4,5
	3	3,3,3
10	2	5,5
	3	3,3,4
11	2	5,6
	3	3,4,4
12	2	6,6
	3	4,4,4
	4	3,3,3,3
13	2	6,7
	3	4,4,5
	4	3,3,3,4
14	2	7,7
	3	4,5,5
	4	3,3,4,4
15	2	7,8
	3	5,5,5
	4	3,4,4,4
	5	3,3,3,3,3
16	2	8,8
	3	5,5,6
	4	4,4,4,4
	5	3,3,3,3,4

RAID 60 – Striping of Double Parity

RAID 60 combines both RAID 6 and RAID 0 features. Data is striped across disks as in RAID 0, and it uses double distributed parity as in RAID 6. RAID 60 provides data reliability, good overall performance and supports larger volume sizes.

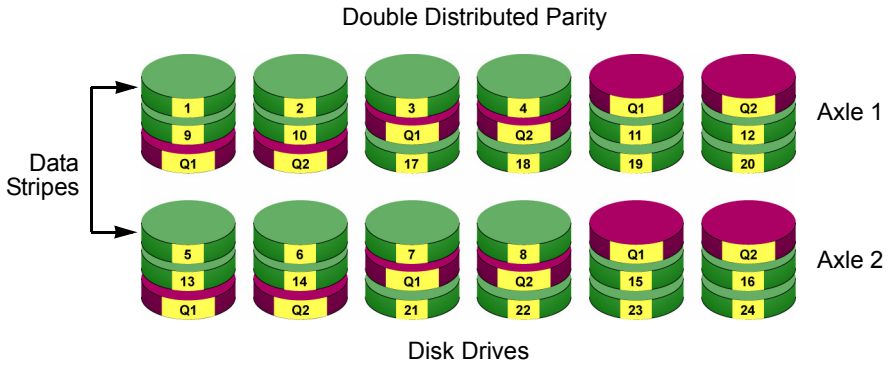


Figure 6. RAID 60 Striping of Double Distributed Parity disk arrays

RAID 60 also provides very high reliability because data is still available even if multiple disk drives fail (two in each axle). The greater the number of axles, the greater the number of disk drives that can fail without the RAID 60 array going offline.

RAID 60 arrays consist of eight or more physical drives.

Using a VTrak E610f/s or E310f/s subsystem expanded by four J300s subsystems, your RAID 60 array supports up to 60 physical drives. See “Configuring JBOD Expansion” on page 24 or page 30. However, Promise recommends that you set aside a few physical drives as hot spares. See “Hot Spare Drive(s)” on page 251.

Recommended applications: Accounting, financial, and database servers; any application requiring very high availability.

RAID 60 Axles

When you create a RAID 60, you must specify the number of *axles*. An axle refers to a single RAID 6 array that is striped with other RAID 6 arrays to make RAID 60. An axle can have from 4 to 16 physical drives, depending on the number of physical drives in the array.

The chart below shows RAID 60 arrays with 8 to 20 physical drives, the available number of axles, and the resulting distribution of physical drives on each axle.

RAID 60 Array		
No. of Drives	**No. of Axles**	**Drives per Axle**
8	2	4,4
9	2	4,5
10	2	5,5
11	2	5,6
12	2	6,6
	3	4,4,4
13	2	6,7
	3	4,4,5
14	2	7,7
	3	4,5,5
15	2	7,8
	3	5,5,5
16	2	8,8
	3	5,5,6
	4	4,4,4,4
17	2	8,9
	3	5,6,6
	4	4,4,4,5
18	2	9,9
	3	6,6,6
	4	4,4,5,5
19	2	9,10
	3	6,6,7
	4	4,5,5,5
20	2	10,10
	3	6,7,7
	4	5,5,5,5
	5	4,4,4,4,4

Choosing a RAID Level

There are several issues to consider when choosing the RAID Level for your VTrak disk array. The following discussion summarizes some advantages, disadvantages, and applications for each choice.

RAID 0

Advantages	Disadvantages
Implements a striped disk array, the data is broken down into blocks and each block is written to a separate disk drive I/O performance is greatly improved by spreading the I/O load across many channels and drives No parity calculation overhead is involved	Not a true RAID because it is not fault-tolerant The failure of just one drive will result in all data in an disk array being lost Should not be used in mission critical environments

Recommended Applications for RAID 0

- Image Editing
- Pre-Press Applications
- Any application requiring high bandwidth

RAID 1

Advantages	Disadvantages
Simplest RAID storage subsystem design Can increase read performance by processing data requests in parallel since the same data resides on two different drives	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 1

- Accounting
- Payroll
- Financial
- Any application requiring very high availability

RAID 1E

Advantages	Disadvantages
Implemented as a mirrored disk array whose segments are RAID 0 disk arrays High I/O rates are achieved thanks to multiple stripe segments Can use an odd number of disks	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 1E

- Imaging applications
- Database servers
- General fileserver

RAID 5

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate	Disk failure has a medium impact on throughput

Recommended Applications for RAID 5

- File and Application servers
- WWW, E-mail, and News servers
- Intranet servers
- Most versatile RAID level

RAID 6

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate Safest RAID level, except for RAID 60	High disk overhead – equivalent of two drives used for parity Slightly lower performance than RAID 5

Recommended Applications for RAID 6

- Accounting and Financial
- Database servers
- Any application requiring very high availability

RAID 10

Advantages	Disadvantages
Implemented as a mirrored disk array whose segments are RAID 0 disk arrays High I/O rates are achieved thanks to multiple stripe segments	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 10

- Imaging applications
- Database servers
- General fileserver

RAID 50

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate High reliability Supports large volume sizes	Higher disk overhead than RAID 5

Recommended Applications for RAID 50

- File and Application servers
- Transaction processing
- Office application with many users accessing small files

RAID 60

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate Safest RAID level	High disk overhead – equivalent of two drives used for parity Slightly lower performance than RAID 50

Recommended Applications for RAID 60:

- Accounting and Financial
- Database servers
- Any application requiring very high availability

Choosing Stripe Size

Stripe Size, also called “Stripe Block Size”, refers to the size of the data blocks written to, and read from, the physical drives. Stripe Size is specified when you create a disk array. In order to change the Stripe Size of an existing disk array, you must delete the disk array and create a new one. You can select Stripe Size directly when you use the Advanced function to create a disk array. If you use the Express function to create a disk array, WebPAM PRO selects the Stripe Size when you choose an Application Type.

The available Stripe Sizes are 64, 128, 256 KB, 512 KB, and 1 MB. 64 KB is the default. There are two issues to consider when selecting the Stripe Size.

First, you should choose a Stripe Size equal to, or smaller than, the smallest cache buffer found on any physical drive in the disk array. Selecting a larger value slows read/write performance because physical drives with smaller cache buffers need more time for multiple accesses to fill their buffers.

Second, if your data retrieval consists of fixed data blocks, such as with some database or video applications, then you should choose that size as your Stripe Size.

If you do not know the cache buffer or fixed data block sizes, Promise suggests you select 64 KB as your Stripe Size. Generally speaking, email, POS, and webservers prefer smaller stripe sizes. Video and database applications prefer larger stripe sizes.

Choosing Sector Size

A sector is the smallest addressable area on a physical disk drive. Sector Size refers to the size of sector measured by the number of bytes of data it can hold. The most common sector size is 512 bytes (512 B). A smaller sector size results in a more efficient use of a disk drive’s capacity. 512 B is the default sector size for logical drives on VTrak.

The number of usable sectors is limited by the addressing method of the computer's operating system:

- Windows 2000 and Windows XP (32-bit) support 10-bit logical bit addressing (LBA), so with 512 B sectors, they can only support up to 2 terabytes (TB) of data storage capacity. To increase the capacity, you must use larger sectors. See “2 TB Limitation” on page 246.
- Windows XP (64-bit), Windows 2003 Server, and Windows Vista support 64-bit LBA, so they are not affected by this limitation. For these OSes, always choose the default 512 B sector size.
- Linux operating systems with the 2.4 kernel do not support variable sector sizes. For these OSes, always choose the default 512 B sector size.

- Linux operating systems with the 2.6 kernel support 64-bit LBA. For these OSes, always choose the default 512 B sector size.

2 TB Limitation

If your Host PC runs Windows 2000 or Windows XP (32-bit), and you want to create logical drives larger than 2TB, you must choose a sector size larger than 512 B when you create the logical drive. The table below correlates sector size with logical drive capacity.

Logical Drive Size	Sector Size
8 to 16 TB	4096 bytes (4 KB)
4 to 8 TB	2048 bytes (2 KB)
2 to 4 TB	1024 bytes (1 KB)
0 to 2 TB	512 bytes (512 B)

Because logical drives can be expanded, you may encounter a situation where the usable capacity of your expanded logical drive is reduced by the addressing issue described above. There are two alternatives:

- Limit your logical drive expansion to within the limits described in the chart.
- Back up your data, then delete your existing logical drive and create a new one with a larger sector size.

Cache Policy

As it is used with VTrak, the term cache refers to any of several kinds of high-speed, volatile memory that hold data moving from your computer to the physical drives or vice-versa. Cache is important because it can read and write data much faster than a physical drive. There are read caches, which hold data as it is read from a physical drive; and write caches, which hold data as it is written to a physical drive.

In order to tune the cache for best performance in different applications, user-adjustable settings are provided. Cache settings are made in conjunction with logical drives:

- When you create a logical drive. See “Creating a Logical Drive” on page 127 or page 174
- On an existing logical drive. See “Making Logical Drive Settings” on page 136 or “Setting Write Cache Policy” on page 176

Read Cache Policy

- **Read Cache** – The read cache is enabled.
- **Read Ahead** – The read cache and the read-ahead feature are enabled. Read-ahead anticipates the next read and performs it before the request is made. Can increase read performance.
- **No Cache** – The read cache is disabled.

Write Cache Policy

- **Write Back** – Data is written first to the cache, then to the logical drive. Better performance. VTrak has a cache backup battery to protect data in the cache from a sudden power failure.
- **Write Thru** – Also “Write Through”. Data is written to the cache and the logical drive at the same time. Safer.

If your write cache policy is set to *Write Back*, the write policy automatically changes to *Write Thru* when all of the following conditions occur:

- The logical drive write policy is set to Write Back
- The Adaptive Writeback Cache feature is enabled
- The cache backup battery goes offline

When the battery comes back online, the write policy automatically changes back to Write Back.

Also see “Cache Mirroring” on page 248.

Adaptive Writeback Cache

On the VTrak subsystem, you can set the logical drive write cache policy to *Write Thru* or *Write Back*.

If you set the write cache policy to *Write Back*, your data is first written to the controller cache, and later to the logical drive. This action improves performance. To preserve the data in the cache in the event of a power failure, the subsystem has a backup battery that powers the cache. To see an estimate of how long the battery will power the cache, see “Checking the Batteries” on page 113 or page 160.

The Adaptive Writeback Cache feature protects your data by changing the write cache settings while the cache backup battery is offline. When all of the following conditions occur:

- The logical drive write policy is set to Write Back
- The Adaptive Writeback Cache feature is enabled
- The cache backup battery goes offline

The write policy automatically changes to *Write Thru*. When the battery comes back online, the write policy automatically changes back to *Write Back*.

To enable the Adaptive Writeback Cache option, see “Making Controller Settings” on page 107 or page 156.

Also see “Replacing a Cache Battery” on page 224.

Cache Mirroring

VTrak subsystems with two controllers include a Cache Mirroring feature. Cache Mirroring causes the local controller to mirror write data to the remote controller. That means, when there is write data in the cache of the controller managing the target logical drive, the same write data is copied to the cache of the other controller as well. This arrangement protects the data from loss, in the event that the local controller fails before the data is written to the logical drive.

Cache Mirroring works whether the write cache policy of your logical drives is set to *Write Back* or *Write Through*. However, you only realize the advantage of Cache Mirroring when the write cache policy is set to *Write Back*.

With Cache Mirroring **enabled**, any write data in the controller cache that has not been written to the logical drive, will be written to the logical drive, even if the controller fails. Enable Cache Mirroring when you require failover/failback protection.

With Cache Mirroring **disabled**, any write data in the controller cache that has not been written to the logical drive, will be lost if the controller fails. On the other hand, write performance increases because of greater bandwidth. Disable Cache Mirroring when you require maximum performance.

To use Cache Mirroring you must:

- Have two controllers in the subsystem
- Set Redundancy Type to Active-Active.
  See “Setting Redundancy for the Subsystem” on page 62 or page 152
- Enable Cache Mirroring under subsystem settings.
  See “Setting Redundancy for the Subsystem” on page 62 or page 152

On subsystems with two controllers, when Cache Mirroring is disabled, LUN Affinity is enabled automatically. See “LUN Affinity” on page 249

Failover and Failback

When one controller fails, the surviving controller takes over logical drive access until the failed controller is brought back online or is replaced. For example, Cache Mirroring is enabled and your logical drives are assigned to Controller 1.

The following actions will happen:

- If Controller 1 goes offline, Controller 2 takes over access to the logical drives assigned to Controller 1.
- All write data that is still in the controller cache will be written to the logical drives, even though the controller managing them has failed.
- If Controller 1 comes back online, Controller 1 takes back access to the logical drives assigned to it.
- If Controller 1 is replaced, the new controller takes over access to the logical drives assigned to Controller 1.

LUN Affinity

VTrak subsystems with two controllers include a LUN Affinity feature. Normally, either controller can access all logical drives. LUN Affinity enables you to specify which controller can access each logical drive. Use this feature to balance the load of your logical drives between the two controllers.

To use LUN Affinity you must:

- Have two controllers in the subsystem
- Enable LUN Affinity under controller settings. See page 107 or page 156

On subsystems with two controllers, when Cache Mirroring is disabled, LUN Affinity is enabled automatically. See “Cache Mirroring” on page 248.

Disk Array Creation

When you create a logical drive using the Advanced method of disk array creation, you can specify the Preferred Controller ID:

- Controller 1 – Assign all logical drives to Controller 1
- Controller 2 – Assign all logical drives to Controller 2
- Automatic – Alternate logical drive assignments between Controllers 1 and 2

Automatic is the default and preferred setting because it will balance the logical drive assignments for you.

When you create a logical drive using the Automatic or Express disk array creation, the logical drives are assigned alternatively between Controllers 1 and 2 automatically.

See “Creating a Disk Array – Automatic” on page 122, “Creating a Disk Array – Express” on page 122, or “Creating a Disk Array – Advanced” on page 123.

Logical Drive Settings

After you have created a logical drive, you can click on the Settings tab and manually change the Preferred Controller ID between Controller 1 and Controller 2. See “Making Logical Drive Settings” on page 136.

If you create logical drives with LUN Affinity disabled, the Preferred Controller ID will show N/A, and your logical drives will be visible to both controllers.

If you create logical drives with LUN Affinity disabled, and later you enable LUN Affinity, all of your logical drives will be assigned to Controller 1. To balance the load, you can reassign some of your logical drives to Controller 2 under the Preferred Controller ID in the Settings tab. See “Making Logical Drive Settings” on page 136.

When you a delete a logical drive, the remaining logical drives keep the same Controller assignments. If you want to rebalance controller assignments of the remaining logical drives, change their Preferred Controller IDs in the Settings tab.

Failover and Failback

When one controller fails, the surviving controller takes over logical drive access until the failed controller is brought back online or is replaced. For example, LUN Affinity is enabled and your logical drives are assigned to Controller 1. The following actions will happen:

- If Controller 1 goes offline, Controller 2 takes over access to the logical drives assigned to Controller 1.
- If Controller 1 comes back online, Controller 1 takes back access to the logical drives assigned to it.
- If Controller 1 is replaced, the new controller takes over access to the logical drives assigned to Controller 1.
- All logical drives assigned to Controller 2 remain accessible by Controller 2. Controller 1 cannot access them at any time.

Capacity Coercion

This feature is designed for fault-tolerant logical drives (RAID 1, 1E, 5, 10, 50, and 60). It is generally recommended to use physical drives of the same size in your disk arrays. When this is not possible, physical drives of different sizes will work but the system must adjust for the size differences by reducing or coercing the capacity of the larger drives to match the smaller ones. With VTrak, you can choose to enable Capacity Coercion and any one of four methods.

Enable Capacity Coercion and select the Method in the Controller Settings menu. See page 107. The choices are:

- GB Truncate – (Default) Reduces the useful capacity to the nearest 1,000,000,000 byte boundary.
- 10GB Truncate – Reduces the useful capacity to the nearest 10,000,000,000 byte boundary.
- Group Rounding – Uses an algorithm to determine how much to truncate. Results in the maximum amount of usable drive capacity.
- Table Rounding – Applies a predefined table to determine how much to truncate.

Capacity Coercion also affects a replacement drive used in a disk array. Normally, when an physical drive fails, the replacement drive must be the same capacity or larger. However, the Capacity Coercion feature permits the installation of a replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drive. For example, the remaining working drives can be 80.5 GB and the replacement drive can be 80.3, since all are rounded down to 80 GB. This permits the smaller drive to be used.

Without Capacity Coercion, the controller will not permit the use of a replacement physical drive that is slightly smaller than the remaining working drive(s).

Initialization

Initialization is done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. The action is useful because there may be residual data on the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives. See “Initializing a Logical Drive” on page 137.

Caution

When you initialize a logical drive, all the data on the logical drive will be lost. Backup any important data before you initialize a logical drive.

Hot Spare Drive(s)

A hot spare is a disk drive that is connected to the disk array system but is not assigned as a member of the disk array. In the event of the failure of a drive within a functioning fault tolerant disk array, the hot spare is activated as a member of the disk array to replace a drive that has failed.

VTrak will replace a failing disk drive in a disk array with an unassigned drive, if one is available. The unassigned drive is not part of any disk array. Such a drive is called a *hot spare* drive. There are two types:

- **Global** – An unassigned disk drive available to any disk array on the VTrak.

- **Dedicated** – An unassigned disk drive that can only be used by a specified disk array.

The hot spare policy function lets you select whether a disk array will access any unassigned disk drive or a designated drive in the event of disk drive failure. See “Managing Spare Drives” on page 141 (WebPAM PROe) or page 190 (CLU) for information on how to make this setting.

The spare drive effectively takes the place of the failed drive and the RAID system immediately begins to rebuild data onto the drive. When the rebuild is complete, the disk array is returned to fault tolerant status.

VTrak includes a function that enables you to return a hot spare drive from a disk array back to spare status. When you create the hot spare drive, check the Revertible box to enable this feature. See “Transition” on page 257.

See also “Critical & Offline Disk Arrays” on page 289.

Partition and Format the Logical Drive

Like any other type of fixed disk media in your system, a RAID logical drive must also be partitioned and formatted before use. Use the same method of partitioning and formatting on an logical drive as you would any other fixed disk.

Depending on the operating system you use, there may or may not be various capacity limitations applicable for the different types of partitions.

RAID Level Migration

To *migrate* a disk array is to do one or both:

- Change its RAID level
- Increase the number of disk drives (sometimes called Expansion)

Migration takes place on an existing Functional disk array without disturbing the existing data. While the disk array is migrating, you can access the data as before. When migration is complete, your disk array will have a different RAID level and/or a larger capacity.

Different types of disk arrays use different organizational models and have varying benefits. The following outline breaks down the properties for each type of RAID supported by Promise products.

From	To	Increase		Redundancy	
		Capacity	Performance	Add	Lose
RAID 50	RAID 10	•			
	RAID 5				•*
	RAID 1E		•		
	RAID 0	•	•		•
RAID 10	RAID 50	•			
	RAID 5	•			
	RAID 1E	•			
	RAID 0	•	•		•
RAID 5	RAID 50			•	
	RAID 10	•	•		
	RAID 1E	•			
	RAID 0	•	•		•
RAID 1E	RAID 50	•			
	RAID 10	•			
	RAID 5	•			
	RAID 0	•			•
RAID 1	RAID 50	•	•		
	RAID 10	•			
	RAID 5	•	•		
	RAID 1E	•			
	RAID 0	•	•		•
RAID 0	RAID 50	•		•	
	RAID 10	•		•	
	RAID 5			•	
	RAID 1E	•		•	
	RAID 1			•	
* Decreases the existing redundancy					

Important

- The Target disk array may require more disk drives than the Source disk array
- If the Target disk array requires an EVEN number of disk drives but the Source disk array has an ODD number, ADD a disk drive as part of the migration process
- You cannot reduce the number of disk drives in your disk array, even if the Target disk array requires fewer disk drives than the Source disk array
- RAID 1 (mirroring) works with two drives only. Only a single-drive RAID 0 disk array or a single-drive JBOD can migrate to RAID 1. Other RAID Levels use too many drives to migrate
- You cannot migrate a disk array when it is Critical or performing activities such as Synchronizing, Rebuilding, and PDM
- You cannot migrate to or from RAID 6 or RAID 60. You must create a new disk array and move your data to it

Ranges of Disk Array Expansion

The Windows 2000 and Windows XP (32-bit) operating systems support a 10-byte LBA format. As a result, these OSes can only recognize 4 billion addresses. If you create a logical drive using the default 512 B sector size, the logical drive will be limited to 2 TB of data, even if there is more space available on your disk drives.

This limitation does not apply to Windows XP (64-bit), 2003 Server, Vista, and Linux OSes with the 2.6 kernel. Linux OSes with the 2.4 kernel do not support variable sector sizes, therefore you cannot apply the solution described here to those OSes.

Note that once you create your logical drive, you cannot change the size of the sectors. Nor can you increase the number of address blocks that the OS recognizes.

You can direct WebPAM PROe to expand a logical drive beyond the maximum expansion size. When the expansion is finished:

- WebPAM PROe will show the logical drive in the desired size.
- Your operating system might show the logical drive at the maximum size listed in the table below.
- Additional capacity might appear as unpartitioned and unformatted.

Current LD Size	Maximum LD Expansion Size	Sector Size
8 to 16 TB	16 TB	4096 bytes
4 to 8 TB	8 TB	2048 bytes
2 to 4 TB	4 TB	1024 bytes
up to 2 TB	2 TB	512 bytes

At this point, you have the choice of:

- Format the unpartitioned/unformatted capacity as a *second* logical drive
- Delete the existing disk array and create a new one in the desired size

Delete and Recreate

If you require a logical drive larger than the maximum expansion size:

1. Backup the data from the current logical drive.
2. Delete the current logical drive.
   See page 129 (WebPAM PROe) or page 175 (CLU).
3. Create a new logical drive with the desired capacity.
   See page 127 (WebPAM PROe) or page 174 (CLU).
4. Restore the data to the new logical drive.

Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays. Media Patrol does not check unconfigured drives.

Media Patrol will also check spare drives, if those drives have Media Patrol enabled. Media Patrol for spare drives is enabled by default. You can disable it in VTrak's Command Line Interface (CLI).

Unlike Synchronization and Redundancy Check, Media Patrol is concerned with the condition of the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled.

You can run Media Patrol from the subsystem. See "Running Media Patrol" on page 68 (WebPAM PROe) or page 153 (CLU).

You can also run Media Patrol on a disk array. See "Running Media Patrol on a Disk Array" on page 131 (WebPAM PROe) or page 171 (CLU).

Predictive Data Migration (PDM)

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare disk drive, similar to Rebuilding a Logical Drive. But unlike Rebuilding, PDM constantly monitors your disk drives and automatically copies your data to a spare disk drive *before* the disk drive fails and your Logical Drive goes Critical. See “Running PDM” on page 68 for WebPAM PROe or page 173 for the CLU.

After the data is copied from the suspect disk drive, the controller marks it with a Stale configuration and a PFA error.

You can clear the Stale configuration and PFA error and put the disk drive back into service. See “Clearing Stale and PFA Conditions” on page 119 for WebPAM PROe or page 163 for the CLU. In some cases, however, you might remove the disk drive for repair or replacement.

PDM Triggers

The following actions trigger PDM:

- A disk drive with unhealthy status (see below)
- Media Patrol finds a disk critical error*
- You initiate PDM manually

*PDM also counts the number of media errors reported by Media Patrol.

A disk drive becomes unhealthy when:

- A SMART error is reported
- The bad sector remapping table fills to the specified level

Because data would be lost if written to a bad sector, when a bad sector is detected, the disk drive creates a map around it. These maps are saved in the bad sector remapping table, which has a capacity of 512 reassigned blocks and 1024 error blocks.

When the table fills to a specified percentage of its capacity, PDM triggers a migration of data from the suspect drive (the disk drive with the bad sectors) to a spare disk drive.

During data migration, you will have access to the Logical Drive but it will respond more slowly to read/write tasks because of the additional operation. The time required for data migration depends on the size of the disk drive.

See “Making Background Activity Settings” on page 66 (WebPAM PROe) or page 186 (CLU).

Transition

The Transition feature enables you to specify “permanent” spare drives for your VTrak subsystem. Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status.

Transition happens *automatically* when the following sequence of events takes place:

- You create a revertible spare drive.

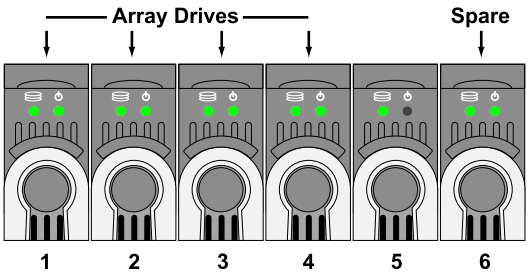
  See page 142 (WebPAM PROe) or page 190 (CLU).
- A physical drive assigned to your disk array fails and the array goes critical or degraded.
- VTrak automatically rebuilds your array to the revertible spare drive and the array becomes functional again.
- You replace the failed physical drive with a new physical drive of equal or greater capacity.
- VTrak automatically transitions (moves) the data from the revertible spare to the new physical drive.
- The new physical drive becomes part of the array and the revertible spare drive returns to its original spare status.

Transition happens *manually* when you specify a different unconfigured physical drive to transition (move) the data from the revertible spare drive.

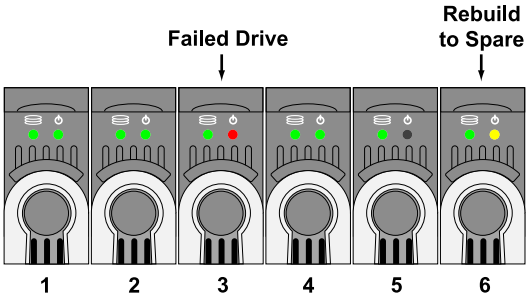
See the example below.

Example

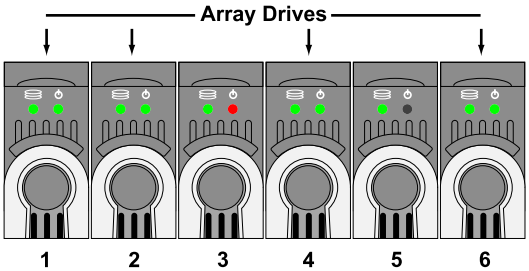
Following is an example to explain the Transition function.



In the example above, there is a four-drive RAID 5 disk array and a global spare drive. Physical drives 1, 2, 3, and 4 belong to the disk array. Physical drive 5 remains unconfigured. Physical drive 6 is a revertible spare drive.



If a physical drive fails in a disk array and there is a spare drive of adequate capacity available, the controller automatically rebuilds the array using the spare drive. In this example, physical drive 3 failed and the array is rebuilt using physical drive 6, the revertible spare drive.

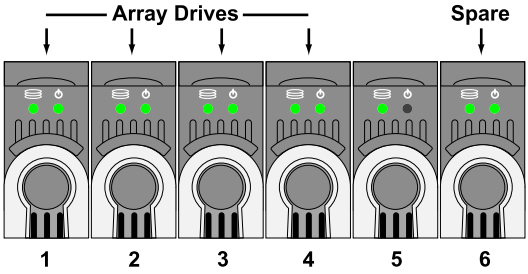


When the rebuild is complete, the spare drive has replaced the failed drive. In this example, failed drive 3 was replaced by spare drive 6. The disk array now consists of physical drives 1, 2, 4, and 6.

There is no spare drive at this moment. Even if physical drive 5 is of adequate capacity, it has not been designated as a spare, therefore the controller cannot use it as a spare.

Automatic Transition

At this juncture, you would replace the failed drive in slot 3 with a new one of the same or greater capacity.



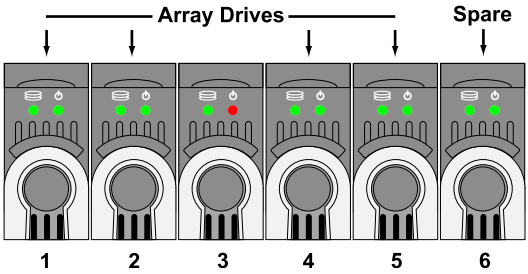
When the VTrak controller detects the new drive in slot 3, it will:

- Automatically transition the data on drive 6 to drive 3
- Return drive 6 to spare status

When the Automatic Transition is finished, physical drives 1, 2, 3, and 4 belong to the disk array and physical drive 6 is a revertible spare drive. The original configuration is restored.

Manual Transition

If you wanted to use the drive in slot 5 as a member of the disk array, rather than the drive in slot 3, you would run the Transition function manually. See page 132 (WebPAM PROe) or page 173 (CLU).



When the Manual Transition is finished, physical drives 1, 2, 4, and 5 belong to the disk array and physical drive 6 is a revertible spare drive.

At this point, you would replace the drive in slot 3. The new drive in slot 3 will be unconfigured until you assign it to a disk array or as a spare.

Chapter 8: Troubleshooting

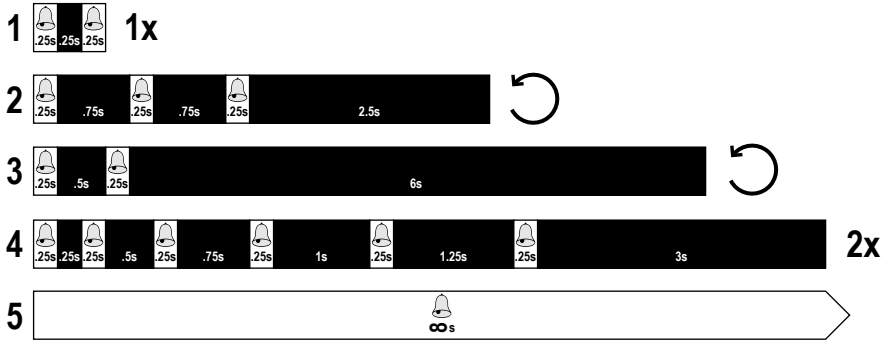
This chapter covers the following topics:

- VTrak is Beeping (page 262)
- LEDs Display Amber or Red (page 263)
- CLU Reports a Problem (page 269)
- WebPAM PROe Reports a Problem (page 271)
- LEDs Display Amber or Red (page 263)
- Event Notification Response (page 274)
- Critical & Offline Disk Arrays (page 289)
- Incomplete Array (page 292)
- Physical Drive Problems (page 293)
- Enclosure Problems (page 295)
- Controller Enters Maintenance Mode (page 298)
- Connection Problems (page 299)
- Browser Does Not Connect to WebPAM PROe (page 301)
- Unsaved Data in the Controller Cache (page 302)

VTrak is Beeping

VTrak's alarm has five different patterns, as shown below.

Figure 1. Audible alarm sound patters



When you first power-up the VTrak, it beeps twice to show normal operation.

The audible alarm sounds at other times to inform you that the VTrak needs attention. But the alarm does not specify the condition. When the alarm sounds:

- Check the front and back of VTrak for red or amber LEDs, as described above.
- If email notification is enabled, check for new messages.
- Check for yellow !s ! red Xs ✕ in Tree View (see page 271).
- Check the event log. See page 63 (WebPAM PROe) or page 188 (CLU).

When a continuous tone sounds, there are multiple alarm patterns sounding at the same time.

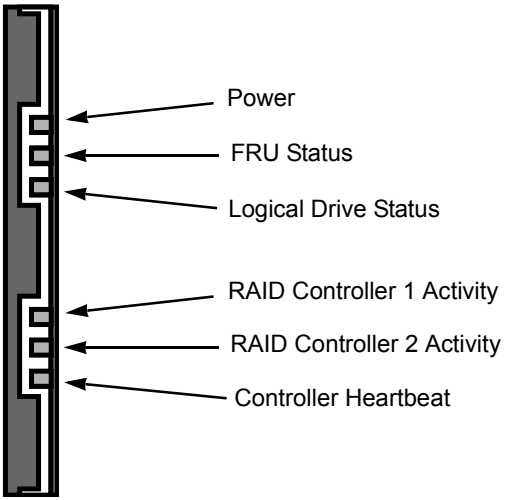
To make alarm settings or cancel an alarm, see page 114 (WebPAM PROe) or page 212 (CLU).

LEDs Display Amber or Red

Front Panel

When the power is switched on, the LEDs on the front of the VTrak will light up.

Figure 2. VTrak front panel LED display. The E310f/s is shown. the E610f/s is similar



When boot-up is finished and the VTrak is functioning normally:

- Controller Heartbeat LED blinks once every two seconds.
- Power, FRU and Logical Drive LEDs display green continuously.
- The RAID Controller LEDs flash green if there is activity on that controller.

See the table below.

LEDs	State				
	Dark	**Steady Green**	**Flashing Green**	**Amber**	**Red**
Power	System Off	Normal			
FRU*	System Off	Normal		Fan, battery or PSU Problem	Fan, battery or PSU Failed
Logical Drive	System Off	Normal		Logical Drive Critical	Logical Drive Offline
Controller Activity	No Activity		Activity		
Controller Heartbeat	System Off		Normal**		

* Field Replacement Unit: includes fan, battery, and power supply unit (PSU).

** Blinks once every two seconds.

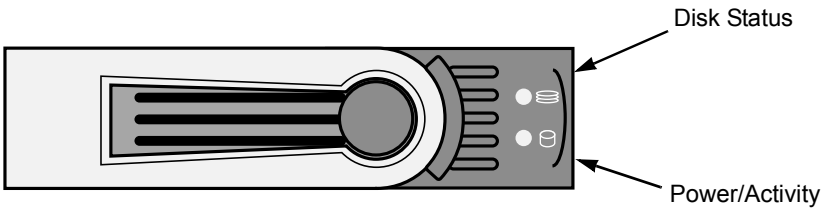
See page 213 for more information about field-replaceable components.
See page 289 for a discussion of critical and offline logical drives.

Drive Status Indicators

There are two LEDs on each Drive Carrier. They report the presence of power and a disk drive, and the current condition of the drive.

The VTrak spins up the disk drives sequentially in order to equalize power draw during start-up. After a few moments the Power/Activity and Disk Status LEDs should display green.

Figure 3. VTrak drive carrier LEDs



LEDs	State				
	Dark	Steady Green	Flashing Green	Amber	Red
Power/ Activity	No Drive	Drive Present	Activity		
Status	No Power/ No Drive	Drive OK		Drive Rebuilding	Drive Error

See “Critical & Offline Disk Arrays” on page 289 for a discussion of rebuilding and failed disk drives.

Back of Enclosure

When the FRU Status LED on VTrak’s front panel shows Amber or Red, check the LEDs on the back of VTrak. These LEDs give the status of the field replaceable units.

Figure 1. VTrak E610f rear view

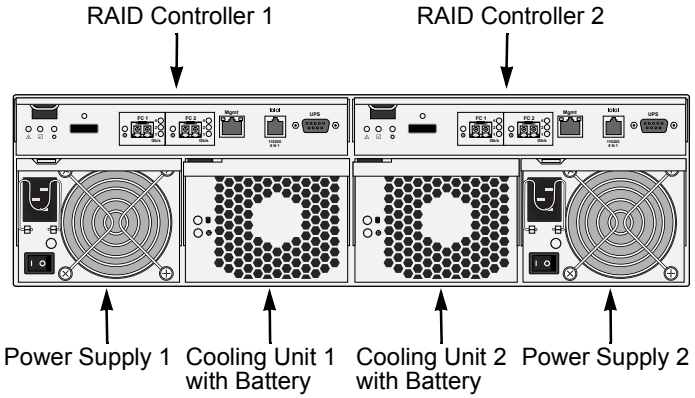


Figure 2. VTrak E610s rear view

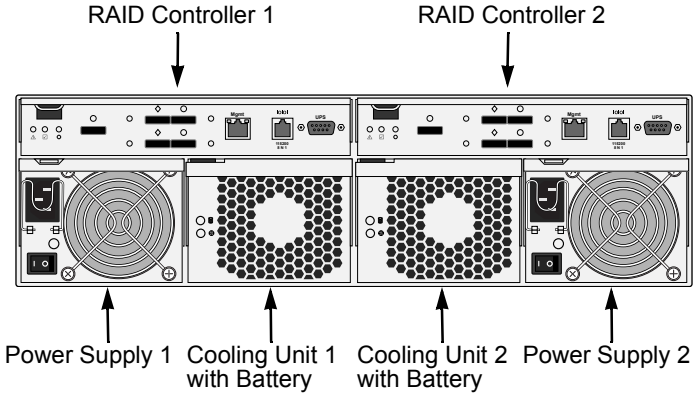


Figure 4. VTrak E310f rear view

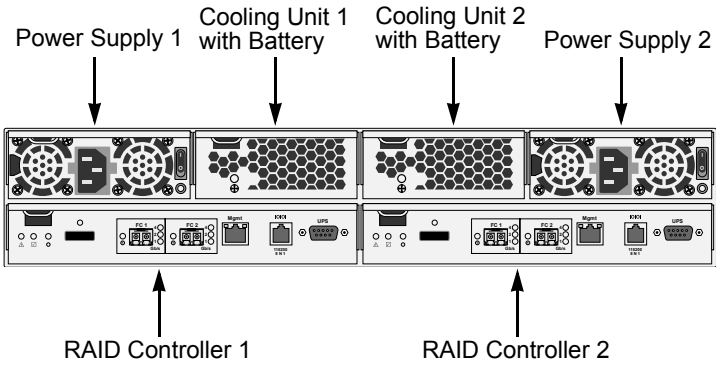


Figure 5. VTrak E310s rear view

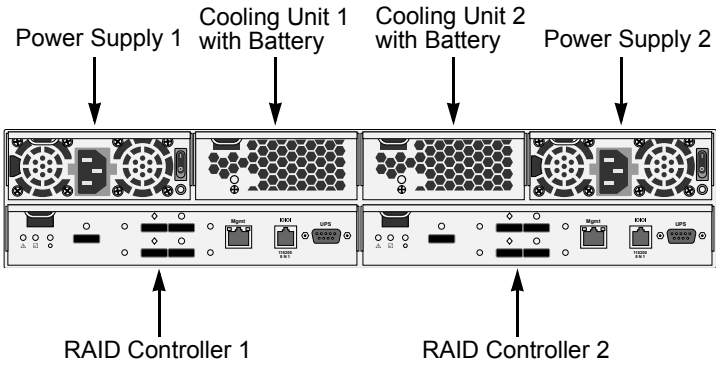
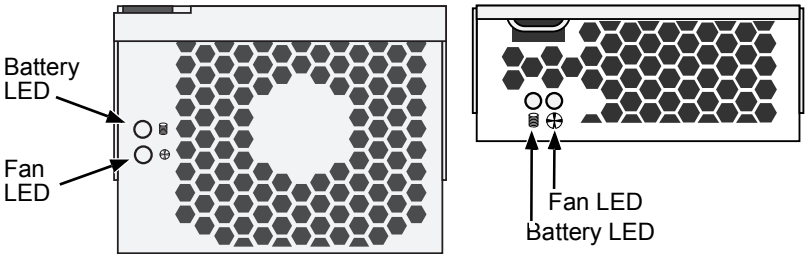


Figure 6. Battery and Fan LEDs (left: E610f/s, right: E310f/s)



Under normal conditions, the power supply and fan LEDs should display green.

LEDs	State			
	Dark	Green	Amber	Red
Power supply	Not detected	OK	Fan failed	Failed
Battery	Not detected	OK		
Fan	Not detected	OK	Wrong speed	Failed

To check a component's installation, follow the same procedure as replacing the component, except that you reinstall the original component rather than a new one. In most cases, this action fixes a bad connection and allows VTrak to detect the component. If this action does not correct the problem, replace the unit. See page 213 for instructions.

The Controller Location LEDs, on the back of the VTrak subsystem, will flash for one minute.

Figure 7. The VTrak E610f/E310f controller LEDs

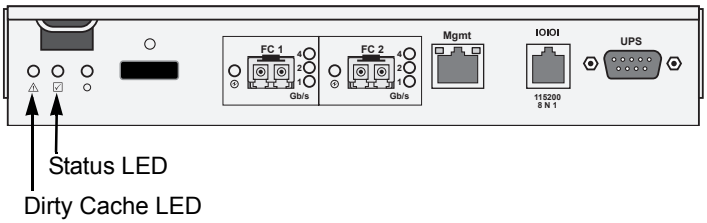
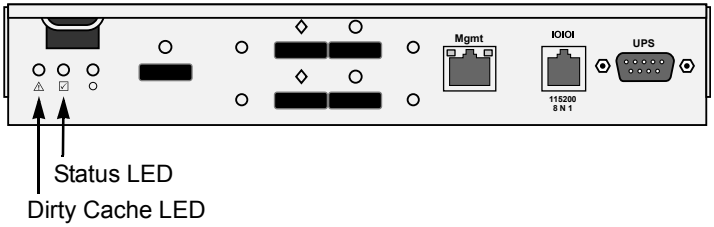


Figure 8. The VTrak E610f/E310s controller LEDs



Under normal conditions, the Controller Status LED (marked with ☑ icon) is green and the Dirty Cache LED (marked with ⚠) icon is dark. See the table below.

LEDs	State			
	Dark	**Green**	**Amber**	**Flashing Amber**
Status	no power	OK	Error	
Dirty Cache	OK		Unsaved data in cache	OK

If the Controller Status LED is amber, restart the VTrak. See “Restarting the Subsystem” on page 104 or page 211.

If the Controller Status LED continues to display amber after startup, contact Promise Technical Support. See “Contacting Technical Support” on page 305.

The Dirty Cache LED flashes during input/output operation. If the LED shines amber and the power is off, there is unsaved data in the cache. Do NOT power down the VTrak while this LED is on. See “Browser Does Not Connect to WebPAM PROe” on page 301 for more information.

CLU Reports a Problem

The CLU reports information passively—you must determine which functions to check based on the sound of the VTrak's audible alarm (see page 262) and any amber or red LEDs (see page 263).

Check the event logs first. Then check the reported component.

Viewing Runtime Events

To display Runtime Events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.

   The log of Runtime Events appears. Events are added to the top of the list. Each item includes:

   - Sequence number – Begins with 0 at system startup.
   - Device – Disk Array, Logical Drive, Physical Drive by its ID number.
   - Severity – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - Timestamp – Date and time the event happened.
   - Description – A description of the event in plain language.

Press the up and down arrow keys to scroll through the log.

Viewing NVRAM Events

This screen displays a list of and information about 63 most important events over multiple subsystem startups.

To display NVRAM events:

1. From the Main Menu, highlight *Event Viewer* and press Enter.
2. Highlight *NVRAM Events* and press Enter.

   The log of NVRAM Events appears. Events are added to the top of the list. Each item includes:

   - Sequence number – Begins with 0 at system startup.
   - Device – Disk Array, Logical Drive, Physical Drive by its ID number.
   - Severity – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
   - Timestamp – Date and time the event happened.
   - Description – A description of the event in plain language.
3. Press the up and down arrow keys to scroll through the log.

Checking a Reported Component

In this example, let us check disk array status.

1. Open the CLU.
2. Highlight *Disk Array Management* and press Enter.
3. Observe the status of your disk arrays.

DaId	Alias	OpStatus	CfgCapacity	FreeCapacity	MaxContiguousCap
0	DA0	OK	75.44GB	66.06GB	66.06GB
1	DA1	Degraded	189.06GB	179.68GB	179.68GB
2	DA2	OK	73.57GB	64.20GB	64.20GB

At this point, you can highlight the Degraded array and press Enter to see more information. See below.

```
Disk Array ID          : 1              Physical Capacity        : 189.06GB
OperationalStatus      : Degraded       MaxContiguousCapacity    : 11.18GB
FreeCapacity           : 179.68 GB      ConfigurableCapacity     : 179.68GB
SupportedRAIDLevels    : 0 5 10 1E

Disk Array Alias       : DA1
MediaPatrol            : Enabled
PDM                    : Enabled

Transport
Rebuild
Predictive Data Migration
Transition
Dedicated Spare Drives in the Array
Physical Drives in the Array
Logical Drives in the Array
[Locate Disk Array]

Save Settings          [CTRL-A]
Restore Settings       [CTRL-R]
Return to Previous Menu
```

From this screen:

- Highlight *Physical Drives in the Array* and press Enter to identify the failed disk drive
- Highlight *Rebuild* and press Enter to rebuild the array after you replace the failed disk drive

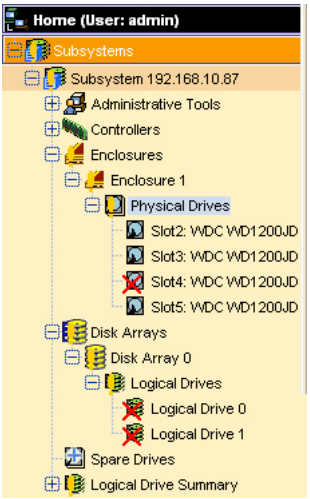
For more information, see “Critical & Offline Disk Arrays” on page 289.

WebPAM PROe Reports a Problem

WebPAM PROe aids in troubleshooting your logical drives and enclosure by continuous monitoring and reporting to the User in the following ways:

- Displays yellow !s red Xs in Tree View.

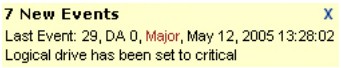
Figure 9. Yellow !s and red Xs in Tree View



- Sends email messages, per your configuration.
- Displays popup messages, per your configuration.

To set up email and popup message notification, see “Setting-up User Event Subscriptions” on page 73.

Figure 10. An example of a popup message



- Keeps a record in the Event Log.

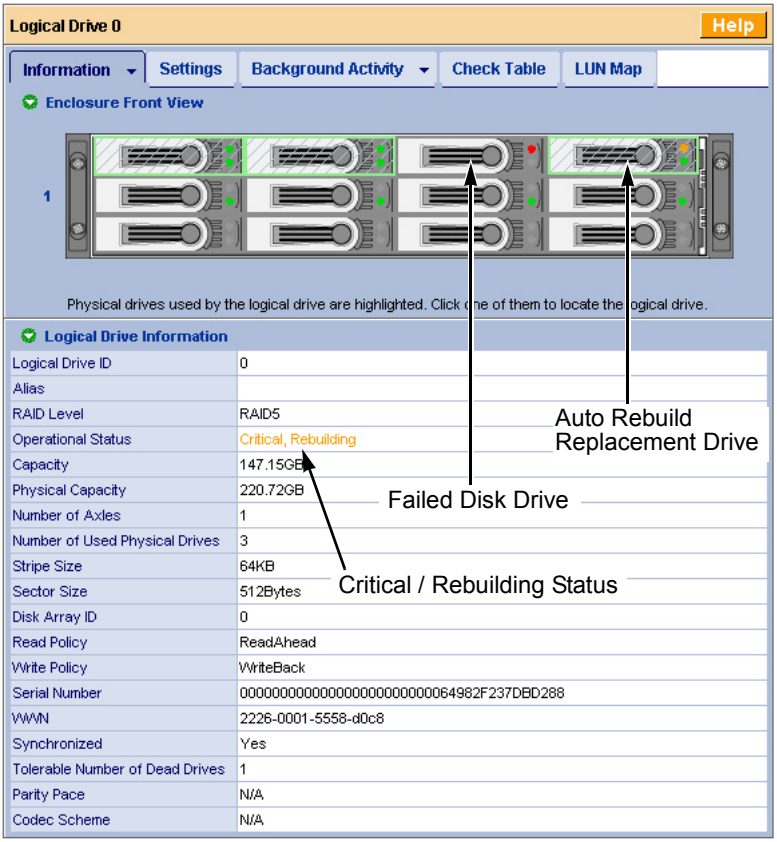
Figure 11. The Event Log

Thu, May 12, 2005 13:30:50 — Max Events Display 10

#	Device	Event ID	Severity	Time	Description
34	DA 0	0x000F0001	Info	May 12, 2005 13:28:47	Rebuild is completed
33	LD 0	0x00090006	Info	May 12, 2005 13:28:47	Rebuild marks the logical drive synchronized upon rebuild completion
32	LD 0	0x00090002	Info	May 12, 2005 13:28:47	Logical drive has been placed online
31	DA 0	0x000F0000	Info	May 12, 2005 13:28:03	Rebuild is started
30	PD 5	0x000D000B	Info	May 12, 2005 13:28:02	Physical Disk has been removed
29	LD 0	0x00090004	Major	May 12, 2005 13:28:02	Logical drive has been set to critical
28	PD 5	0x000D001A	Major	May 12, 2005 13:28:02	Physical Disk is marked as DEAD due to removal
27	Spare 0	0x001D0001	Info	May 12, 2005 02:00:26	Spare check completed successfully on the given spare drive
26	Spare 1	0x001D0001	Info	May 12, 2005 02:00:26	Spare check completed successfully on the given spare drive
25	Spare 0	0x001D0000	Info	May 12, 2005 02:00:26	Spare check started on the given spare drive

- Keeps a record in the Event Log.
- Displays full information in Management View.

Figure 12. A failed disk drive shown in Management View



Also see these troubleshooting topics:

- “Event Notification Response” on page 274
- “Critical & Offline Disk Arrays” on page 289
- “Frequently Asked Questions” on page 303

Event Notification Response

When you select Event Notification, WebPAM PROe sends popup and/or email messages regarding its status. The messages you see depend on your notification selection and what is currently happening in the VTrak. See “Setting-up User Event Subscriptions” on page 73.

The table below cites:

- Reported Events – Events that require you to take action
- Corrective Actions – The action you should take in response to the event

A list of event categories is shown below.

- Battery (page 274)
- Blowers (page 275)
- Cache (page 276)
- Controller (page 276)
- Disk Array (page 276)
- Drive Interface Controller (page 277)
- Enclosure (page 277)
- Event Log (page 277)
- Fibre Channel (page 278)
- Host Interface Controller (page 278)
- Logical Drive (page 279)
- Media Patrol (page 280)
- Online Capacity Expansion (page 280)
- PDM (page 281)
- Physical Disk (page 281)
- PSU (Power Supply Units) (page 283)
- PSU Fans (page 283)
- RAID Level Migration (page 283)
- Rebuild (page 284)
- Redundancy Check (page 285)
- Resource (page 285)
- Spare Check (page 285)
- Spare Drives (page 286)
- SMART (page 286)
- Stripe Level Migration (page 286)
- Synchronization (page 287)
- System (VTrak) (page 287)
- Transition (page 287)
- Watermark (page 288)

Reported Event	Corrective Action
Battery	
Battery temperature is above the threshold	The battery is too hot. Verify proper airflow around the through the VTrak. If airflow is OK, replace the battery. See page 224.
Battery temperature is normal	Normal.
Battery capacity is below the threshold	Battery is drained. Run battery reconditioning. See page 114 or page 160.

Reported Event	Corrective Action
Battery capacity is normal	Normal.
Battery is discharging	Battery is undergoing reconditioning.
Battery is charging	Battery is being recharged.
Battery reconditioning is complete	Battery reconditioning is finished.
Battery is malfunctioning	Run battery reconditioning. See page 114 or page 160. If this message reappears, replace the battery.
Battery reconditioned successfully	Battery reconditioning is finished.
Battery reconditioning has failed	Replace the battery. See page 224.
Battery is reaching end of life	Replace the battery. See page 224.
Battery is removed	The battery was disconnected or removed. Reinstall the battery. See page 224.
Battery charging failed	Replace the battery. See page 224.
Battery reconditioning started	Battery reconditioning has begun.
Battery recondition terminated	The battery was disconnected or removed during reconditioning. Reinstall the battery. See page 224.
Blowers	
Blowers have started	Normal.
Blowers have stopped	Verify that the cooling unit is properly installed. If the blower still does not turn, replace the blowers. See page 219.
Blower speed is increased	Check the VTrak for overheating. See page 295.
Blower speed is decreased	Temporary overheat condition was corrected.
Blowers are NOT functioning	Replace the blowers. See page 219.
Blowers have been inserted	Normal.

Reported Event	Corrective Action
Blowers have been removed	Reinstall the cooling unit(s). If the blowers does not turn, replace the blowers. See page 219.
Blowers are functioning normally	Normal.
Blowers are NOT installed	Reinstall the cooling unit(s). If the blowers does not turn, replace the blowers. See page 219.
Blower status is unknown	Check for airflow out of the cooling unit. If there is none, check for proper installation.
Cache	
BBU flushing has started	VTrak's cache is being flushed.
BBU flushing has ended	VTrak's cache has been flushed.
BBU flushing has failed	VTrak's cache could not be flushed. Check your cache flush interval setting. See page 107.
Controller	
The controller parameter(s) changed by user	The user successfully change controller settings. See page 107.
The controller has new crash information	Check the event logs. See page 63.
Controller temperature is above the threshold/ warning threshold	The VTrak controller is overheating. Check for airflow around and through the controller, and verify that all fans are working. Replace fans as needed.
Controller temperature is above the critical threshold	The VTrak controller is seriously overheating. Check for airflow around and through the controller, and verify that all fans are working. Replace fans as needed.
Disk Array	
New disk array has been created	Result of settings or user action. Normal.
Disk array has been deleted	Result of settings or user action. Normal.
Disk array has been added	Result of settings or user action. Normal.
Disk array has been removed	The physical drives of the disk array were removed from the enclosure.

Reported Event	Corrective Action
Disk array settings have been changed	The user successfully logical drive settings. See page 127.
Drive Interface Controller	
Drive-interface controller found	Normal.
Drive-interface controller is NOT found	Restart the VTrak. See page 215. If this message appears repeatedly, contact Technical Support. See page 305.
Drive-interface diagnostics has passed	Normal.
Drive-interface diagnostics has failed	Restart the VTrak. See page 215. If this message appears repeatedly, contact Technical Support. See page 305.
Drive-interface controller has generated a general/ data parity error.	Drive-to-controller parity error. If this message appears repeatedly, contact Technical Support. See page 305.
Enclosure	
Enclosure temperature is above the threshold/ warning threshold	The VTrak is overheating. Check for airflow around and through the VTrak, and verify that all fans are working. Replace fans as needed.
Enclosure temperature is above the critical threshold	The VTrak is seriously overheating. Check for airflow around and through the VTrak, and verify that all fans are working. Replace fans as needed.
Enclosure temperature is within the normal range	Normal.
Event Log	
Event logging is enabled	Event logging has been successfully enabled.
Event logging is disabled	Event logging has been disabled.
Event log buffer is cleared in RAM	The event log was cleared.
Event log buffer is cleared in NVRAM	The non-volatile RAM event log was cleared.
Event log buffer is cleared in MDD	The MDD (disk drive) event log was cleared.

Reported Event	Corrective Action
Fibre Channel	
Fibre Channel controller has detected bus reset	The initiator sent a reset command. If this message appears repeatedly, contact Technical Support. See page 305.
Fibre Channel controller has received a LUN reset command.	Result of user action. Normal.
Fibre Channel controller has encountered a fatal error	Restart the VTrak. See page 215. If this message appears repeatedly, contact Technical Support. See page 305.
Fibre Channel link is up	FC link connected and ready. Normal.
Fibre Channel link is down	FC link disconnected or otherwise not working.
Fibre Channel controller settings have changed	Result of user action. Normal.
Host Interface Controller	
Host-interface controller has detected bus reset	The initiator sent a reset command. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has encountered an unrecoverable error	Restart the VTrak. See page 215.
Host-interface controller has received an abort-task/ abort task set/clear task set command.	Result of user action. Normal.
Host-interface controller has received an clear ACA command.	Result of clearing an auto contingent alliance condition. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has received a LUN reset command.	Result of user action. Normal.
Host-interface controller has received a bus reboot	The VTrak rebooted itself. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has encountered an unknown error	An unidentified error occurred. If this message appears repeatedly, contact Technical Support. See page 305.

Reported Event	Corrective Action
Host-interface controller has encountered a system error	A VTrak system error occurred. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller has encountered a fatal error	Restart the VTrak. See page 215. If this message appears repeatedly, contact Technical Support. See page 305.
Host-interface controller settings have changed	Result of user action. Normal.
Logical Drive	
Logical drive initialization has started	Result of user action. Normal.
Logical drive initialization has completed	Logical drive is ready to use. Normal.
Logical drive initialization has paused	Initialization paused because of user intervention, schedule or a higher priority background activity.
Logical drive initialization has resumed	Initialization has resumed again after a pause.
Logical drive initialization has stopped	Initialization stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Logical drive initialization marks the logical drive offline	Initialization failure due to a failed disk drive. Replace the disk drive, delete and recreate the logical drive. See page 17 and page 127.
Logical drive initialization is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
Logical drive initialization is queued	Initialization has been set manually or by schedule.
A new logical drive has been created	Result of user action. Normal.
Logical drive has been deleted	Result of user action. Normal.
Logical drive has been placed online	The physical drives of the array are restored to online status.
Logical drive has been placed online. Possible data loss	One or more physical drives in the array went offline. See page 289.

Reported Event	Corrective Action
Logical drive has been set to critical.	One or more physical drives in the array went offline. See page 289.
Logical drive axle has been placed online	RAID 50. One of the axles (RAID 5 arrays) returned on online status.
Media Patrol	
Media patrol is started	Result of settings or user action. Normal.
Media patrol is completed	Normal.
Media patrol is paused	Media patrol paused because of user intervention, schedule or a higher priority background activity.
Media patrol is resumed	Media patrol has resumed again after a pause.
Media patrol is stopped	Media patrol stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Media patrol is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
Media patrol is queued	Media patrol has been set manually or by schedule.
Media patrol is stopped internally	Media patrol stopped because the disk array was deleted or removed.
Online Capacity Expansion	
Online capacity expansion has started	Result of settings or user action. Normal.
Online capacity expansion has completed	Normal.
Online capacity expansion has paused	Expansion paused because of user intervention, schedule or higher priority background activity.
Online capacity expansion has resumed	Expansion has resumed again after a pause or a reboot.
Online capacity expansion has stopped	Expansion stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Online capacity expansion has encountered a physical disk error	Bad block found on a disk drive. Migration will finish. Check the disk drive check table after migration and replace disk drive as needed. See page 138.

Reported Event	Corrective Action
Online capacity expansion is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
Online capacity expansion is queued	Synchronization has been set manually or by schedule.
PDM	
PDM is started	Result of settings or user action. Normal.
PDM is completed	Normal.
PDM is paused	PDM paused because of user intervention, schedule or a higher priority background activity.
PDM is resumed	PDM has resumed again after a pause.
PDM is stopped	PDM stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
PDM is switched to rebuild.	PDM changed to rebuild because the logical drive went critical
PDM is stopped internally	The destination drive was removed or used for a rebuild.
Physical Disk	
Physical disk is marked online	Disk drive restored to normal operation.
Physical disk is marked online	Disk drive removed from service due to errors. If necessary, try to force the disk online. See page 119 or page 164.
Physical disk is marked as dead.	Disk drive failure. Replace the disk drive. See page 17.
Physical disk has been reset	Disk drive reset after error and should function normally.
Physical disk assigned as global spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as global spare	Result of settings or user action. Normal.
Physical disk assigned as dedicated spare	Result of settings or user action. Normal.

Reported Event	Corrective Action
Physical disk is no longer assigned as dedicated spare	Result of settings or user action. Normal.
Physical disk has been inserted	A disk drive has been inserted into the VTrak subsystem.
Physical disk has been removed	A disk drive has been removed from the VTrak subsystem.
Bad sector is found on physical disk	Disk drive has a bad sector. The drive should remap around the bad sector. If this message appears repeatedly, replace the disk drive.
Error is detected in remap sectors	Disk drive has a bad remap sectors. If this message appears repeatedly, replace the disk drive.
Command times out on physical drive	Disk drive not responding to commands. If this message appears repeatedly, replace the disk drive.
Physical disk negotiation speed is decreased.	Disk drive had to reduce its data rate. If this message appears repeatedly, replace the disk drive.
Previously configured disk is no longer found	Disk drive may have failed or was removed from the enclosure. Replace or reinstall the disk drive as needed.
A physical disk has encountered an unknown (non-ECC) media error.	Disk drive experienced an unknown error. If this message appears repeatedly, replace the disk drive.
A physical disk has encountered PFA condition	A potentially faulty address or bad sector was found.
A configured dead physical drive has been inserted	The disk drive inserted into the VTrak was marked as dead and will not work on the VTrak. Replace the disk drive.
A physical drive page 0/1 settings have been changed	Result of settings or user action. Normal.
Physical disk is marked as dead due to removal/ failure of reassign sectors/PFA condition/ forced offline state	Replace the disk drive.
PSU (Power Supply Units)	

Reported Event	Corrective Action
PSU is not inserted/has been removed	A power supply unit is missing from the VTrak. Reinstall the power supply unit.
PSU is off	A power supply unit is present but turned off. Turn on he power supply.
PSU is on	Normal.
PSU is installed/ operational and turned on	Normal.
PSU is installed/ operational and turned off	A power supply unit is present but turned off. Turn on he power supply.
PSU is malfunctioning and turned on/off	Replace the power supply unit.
PSU 12V/5V/3.3V power is out of the threshold range	Replace the power supply unit.
PSU 12V/5V/3.3V power is within the range	Normal.
PSU Fans	
PSU fan has turned on.	Normal.
PSU fan has turned off.	Verify that the power supply is turned on. If the fan still does not turn, replace the power supply. See page 218.
PSU fan speed increased.	Check the VTrak for overheating. See page 295.
PSU fan speed decreased.	Temporary overheat condition was corrected.
PSU fan is malfunctioning	Replace the power supply. See page 218.
PSU fan is functioning normally	Normal.
PSU fan status is unknown.	Check for airflow out of the power supply. If there is none, check for proper installation and turn the power supply on.
RAID Level Migration	
RAID Level migration is started	Result of settings or user action. Normal.
RAID Level migration is completed	Normal.

Reported Event	Corrective Action
RAID Level migration is paused	Migration paused because of user intervention, schedule or a higher priority background activity.
RAID Level migration is resumed	Migration has resumed again after a pause.
RAID Level migration is stopped	Migration stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
RAID Level migration has encountered a physical disk error	Bad block found on a disk drive. Migration will finish. Check the disk drive check table after migration and replace disk drive as needed. See page 138.
RAID Level migration is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
RAID Level migration is queued	Migration has been set manually or by schedule.
Migration has detected/ cleared stale NV Watermark	Watermarks are progress markers left as the result of interrupted RAID migrations. If the watermark was cleared, migration should finish.
Array was incomplete due to missing NV Watermark	RAID migration was interrupted by a shutdown. If array is online, try migration again. See page 129. If array is offline, delete and recreate array. See page 125 and page 123.
Rebuild	
Rebuild is started	Result of settings or user action. Normal.
Rebuild is completed	Normal.
Rebuild is paused	Rebuild paused because of user intervention, schedule or a higher priority background activity.
Rebuild is resumed	Rebuild has resumed again after a pause.
Rebuild is stopped	Rebuild stopped because of user intervention, schedule or the logical drive was deleted or the target disk drive encountered an error. If rebuild stopped by user intervention, restart the rebuild. See page 130.
Rebuild stopped internally	The logical drive is offline. See page 289.
Rebuild is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
Rebuild is queued	Rebuild has been set manually or by schedule.

Reported Event	Corrective Action
Rebuild marks logical drive synchronized upon rebuild completion	Result of successful rebuild. Normal.
Redundancy Check	
Redundancy Check is started	Redundancy Check has started manually or by schedule.
Redundancy Check is completed	Redundancy Check has finished.
Redundancy Check is paused	Redundancy Check paused because of user intervention, schedule or a higher priority background activity.
Redundancy Check is resumed	Redundancy Check has resumed again after a pause.
Redundancy Check is stopped	Redundancy Check stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Redundancy Check is aborted due to internal error	System resources are low. Reduce system load or restart the VTrak. See page 215.
Redundancy Check encountered inconsistent block(s)	Check the logical drive's inconsistent block table. See page 138. Rebuild the disk array if necessary. page 130.
Redundancy Check task is queued	Redundancy Check has been set manually or by schedule.
Redundancy Check task is stopped internally	The logical drive is offline. See page 289.
Resource	
Resource is NOT available	System resources are low. Reduce system load or restart the VTrak. See page 215.
Spare Check	
Spare check started on the given spare drive	Result of settings or user action. Normal.

Reported Event	Corrective Action
Spare check completed successfully on the given spare drive	Normal.
Spare Drives	
Physical disk assigned as global spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as global spare	Result of settings or user action. Normal.
Global Spare has been deleted	Result of settings or user action. Normal.
Physical disk assigned as dedicated spare	Result of settings or user action. Normal.
Physical disk is no longer assigned as dedicated spare	Result of settings or user action. Normal.
Dedicated Spare has been deleted	Result of settings or user action. Normal.
SMART	
SMART error is received	A disk drive reported a SMART error. If this message appears repeatedly, replace the disk drive.
Stripe Level Migration	
Stripe Level migration is started	Result of settings or user action. Normal.
Stripe Level migration is completed	Normal.
Stripe Level migration is paused	Migration paused because of user intervention, schedule or a higher priority background activity.
Stripe Level migration is resumed	Migration has resumed again after a pause.
Stripe Level migration is stopped	Migration stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Stripe Level migration has encountered a physical disk error	Bad block found on a disk drive. Migration will finish. Check the disk drive check table after migration and replace disk drive as needed. See page 138.

Reported Event	Corrective Action
Stripe Level migration is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
Stripe Level migration is queued	Migration has been set manually or by schedule.
Synchronization	
Synchronization is started	Result of settings or user action. Normal.
Synchronization is completed	Normal.
Synchronization is paused	Synchronization paused because of user intervention, schedule or higher priority background activity.
Synchronization is resumed	Synchronization has resumed again after a pause or a reboot.
Synchronization is stopped	Synchronization stopped because of user intervention, schedule or the logical drive was deleted or went critical or offline.
Synchronization is aborted due to an internal error.	System resources are low. Reduce system load or restart the VTrak. See page 215.
Synchronization is queued	Synchronization is already running on another logical drive in the same array.
Synchronization is stopped internally	Synchronization stopped because the disk array was deleted or removed.
System (VTrak)	
The system is started	The VTrak has been started.
The system is stopped	The VTrak was shut down.
Transition	
Transition is started	Result of settings or user action. Normal.
Transition is completed	Normal.
Transition is paused	Transition paused because of user intervention, schedule or a higher priority background activity.
Transition is resumed	Transition has resumed again after a pause.
Transition is stopped	Transition stopped because of user intervention or the logical drive was deleted.

Reported Event	Corrective Action
Transition was switched to rebuild	Transition changed to rebuild because the logical drive went critical.
Watermark	
Migration has detected/ cleared stale NV Watermark	Watermarks are progress markers left as the result of interrupted RAID migrations. If the watermark was cleared, migration should finish.
Array was incomplete due to missing NV Watermark	RAID migration was interrupted by a shutdown. If array is online, try migration again. See page 129. If array is offline, delete and recreate array. See page 125 and page 123.

Critical & Offline Disk Arrays

A fault-tolerant disk array—RAID 1, 1E, 5, 10, and 50—goes *critical* when a disk drive is removed or fails. A RAID 6 or 60 disk array—goes *degraded* when a disk drive is removed or fails and *critical* when two disk drives are removed of fail.

Due to the fault tolerance of the disk array, the data is still available and online. However, once the disk array goes critical, the disk array has lost its fault tolerance, and performance may be adversely affected.

If the fault was caused by a failed drive that was removed, the drive must be replaced by another drive, either identical or larger, in order for the RAID system to rebuild and restore optimal configuration.

If your fault-tolerant disk array—RAID 1, 1E, 5, 6, 10, 50, and 60— goes *offline*, contact Promise Technical Support. See “Contacting Technical Support” on page 305.

Warning

Take no further corrective action until you have consulted with Promise Technical Support.

A non-fault tolerant disk array—RAID 0—goes *offline* when a disk drive is removed or fails. Since the disk array is not fault tolerant, the data stored in the disk array is no longer accessible.

If one disk drive fails, all of the data on the disk array is lost. You must replace the failed drive. Then, if the disk array had more than one disk drive, delete the disk array and re-create it. Restore the data from a backup source.

When a Physical Drive Fails

VTrak provides both audible and visual indicators to alert you of a disk drive failure. The following will occur when a disk drive fails or goes offline:

- The Logical Drive LED changes from green to amber. See page 263.
- The Disk Carrier Status LED changes from green to red. See page 264.
- The audible alarm repeatedly sounds two short beeps. See page 262.
- WebPAM PROe reports the condition. See page 271.

Also see “Physical Drive Problems” on page 293.

With a Hot Spare Drive

When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array will begin to rebuild automatically using the spare drive.

After the disk array rebuilds itself using the spare drive, you must replace the failed drive.

To set up a spare drive, see “Creating a Spare Drive” on page 142 (WebPAM PROe) or page 190 (CLU).

Without a Hot Spare Drive

If there is no hot spare drive of adequate capacity, you must remove the failed drive and install an unconfigured replacement drive of the same or greater capacity in the same slot as the failed drive. Until you install the replacement drive, the logical drive will remain Degraded.

- If the Auto Rebuild function is ENABLED, the disk array will begin to rebuild automatically as soon as you replace the failed drive.
- If the Auto Rebuild function is DISABLED, you must manually rebuild the disk array after you replace the failed drive.

To enable Automatic Rebuild, see “Making Background Activity Settings” on page 66 (WebPAM PROe) or page 186 (CLU).

To set Hot Spare Policy, see “Making Spare Drive Settings” on page 143 (WebPAM PROe) or page 191 (CLU).

Important

If your replacement disk drive was formerly part of a different disk array or logical drive, you must clear the configuration data on the replacement drive before you use it.
See “Clearing Stale and PFA Conditions” on page 119 (WebPAM PROe) or page 163 (CLU).

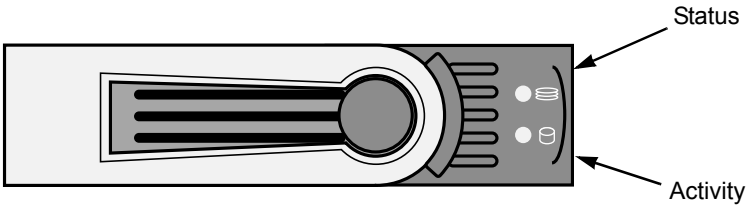
Rebuild Operation

During rebuild:

- The alarm sounds a single short beep, repeated
- No warning icon displays over the Disk Array or Logical Drive in the Tree.

  Management View reports the Disk Array’s Operational Status as OK, Rebuilding.
- The drive carrier holding the rebuilding physical drive displays a green Activity (lower) LED while the Status (upper) LED flashes green once per second.

Figure 13. Drive carrier LEDs



During rebuilding, you can still read and write data to the logical drive. However, fault tolerance is lost until the Disk Array returns to OK (not-rebuilding) status.

After a successful rebuild:

- The alarm is silent
- The Disk Array's Operational Status as OK
- The rebuilt disk drive Status LED displays steady green

Incomplete Array

An incomplete array can result from any of the following conditions:

- The NVRAM watermark for the RAID level migration currently in progress is missing or cannot be found
- A physical drive goes missing during transport

See “Physical Drive Failed” on page 293 for more information.

When VTrak discovers an incomplete array, WebPAM PROe displays a dialog box asking you to:

- Click the **OK** button to accept the incomplete array
- Click the **Cancel** button to reject the incomplete array

Before you accept the incomplete array, be sure all of the physical drives are present and that their drive carriers are properly installed into the enclosure. See “Installing Disk Drives” on page 18.

If you choose to accept the incomplete array:

1. Click **OK** in the incomplete array dialog box.
2. Check the operational status of the logical drives in the array.
    - If the logical drives are *critical* or *degraded*, proceed with a rebuild. See “Rebuilding a Disk Array” on page 130 or page 172.
    - If the logical drives are *offline*, contact Technical Support. See “Contacting Technical Support” on page 305
3. Restore your data from a backup source, if required.

The CLU displays the option *Accept Incomplete Array* on the Disk Array Info and Settings screen. Highlight the option and press Enter to accept the incomplete array.

If you choose NOT to accept the incomplete array:

1. Click **Cancel** in the incomplete array dialog box.
2. Do one of the following:
    - Delete the array. See “Deleting a Disk Array” on page 125 or page 169.
    - Replace the missing physical drive.

Physical Drive Problems

Physical Drive Offline

Check the drive for:

- PFA Condition – Caused by a bad block or sector.
  See “Clearing Stale and PFA Conditions” on page 119.
- Stale Configuration – Caused by obsolete array information on the physical drive. Identify the disk array to which the physical drive belongs. Then delete the disk array. See “Deleting a Disk Array” on page 125.

  If the error condition remains on the physical drive, clear the error condition. See “Clearing Stale and PFA Conditions” on page 119.

Physical Drive Not Usable

This condition occurs when you have:

- Two controllers in your VTrak subsystem and a SATA drive without an AAMUX adapter. See “AAMUX Adapter” on page 18.
- A missing or defective SAS cable between the VTrak subsystem and a JBOD enclosure.

Physical Drive Failed

When physical drive status shows *failed*, the physical drive cannot be repaired. You must replace the failed drive.

Physical Drive Fails during Migration

VTrak has two methods for migrating a disk array:

- DDF – The default setting. Slower but reliable
- NVRAM – An optional setting that requires special access. Faster but risks data loss

Normally, RAID level migration is done under the default Disk Data Format (DDF) setting. If a physical drive or the controller fails during migration, the disk array goes critical, and you can rebuild it. Migration under DDF can take up to several hours depending on the number and size of the physical drives and data input/output activity.

You can set the VTrak to migrate disk arrays under Non-Volatile Random Access Memory (NVRAM), a much faster process because it writes data to the memory in the controller. However, if a physical drive or the controller fails during migration, the logical drives will go offline and you will lose data. See “Incomplete Array” on page 292.

Because the setting for migration under NVRAM requires special access, most users will not encounter this condition.

Physical Drive Fails during Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same VTrak enclosure
- From one VTrak enclosure to another

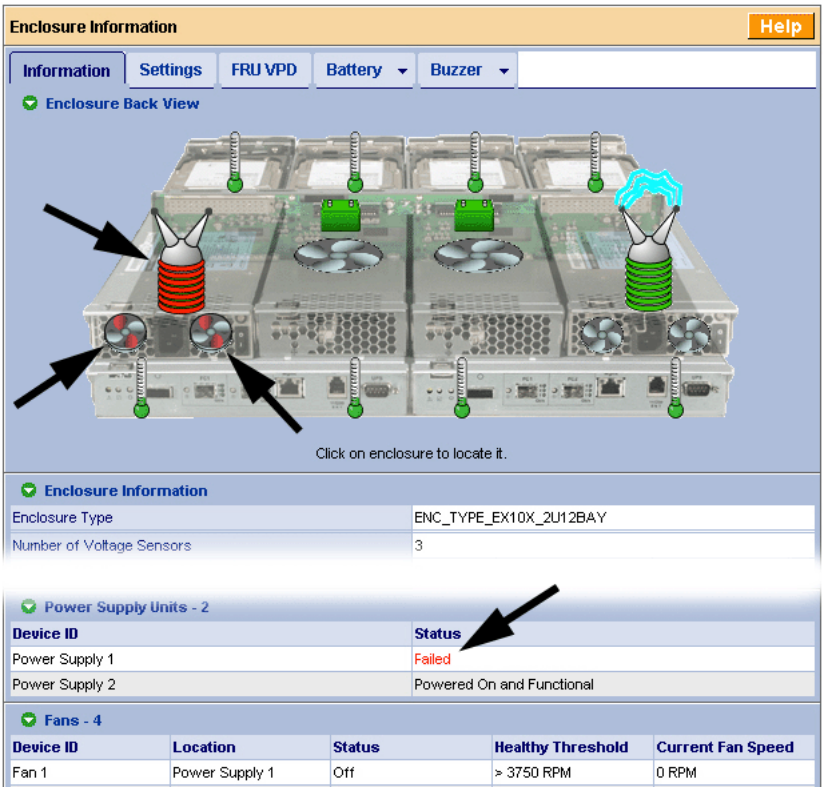
If a physical drive fails during a transport, or you do not move all of the physical drives to their new locations, WebPAM PROe will display an incomplete array. See “Incomplete Array” on page 292.

Enclosure Problems

WebPAM PROe displays yellow !s red Xs in Tree View to identify components that need attention.

When a yellow ! appears over a Subsystem in Tree View, click on the Enclosure icon. The Enclosure screen will display (below).

Figure 14. Enclosure information in Management View



In this example, a power supply has failed. The Enclosure Diagram displays color and motion changes to identify the failed power supply. In this case, you must replace the power supply.

Note that the image above was shortened to fit on the page.

Overheating

Overheating is a potentially serious condition because the excessively high temperatures can lead to disk drive failure and controller malfunction.

Overheating usually results from:

- Fan failure
- Poor air circulation around the enclosure

WebPAM PROe reports failed fans along with elevated temperature. On VTrak, there are two kinds of fans:

- Power supply, 2 fans each
- Cooling units, 1 fan each

If a power supply fan fails, you must replace the power supply. If a cooling unit fan fails, you can remove the cooling unit and replace only the fan itself.

No tools are required for either procedure. See page 219 for instructions on replacing the fans.

Air circulation around the VTrak enclosure may be a more complex problem. Use the thermometer icons to help you locate the specific hot spot. Check for these conditions:

- Accumulated dust or objects blocking the fans
- Less than a minimum of 5 inches (13 cm) space between the back of the VTrak and the wall or other object
- Ambient temperature above 95°F (35°C) where the VTrak is operating

To cool down a VTrak:

- Correct any problems identified above
- Power it down and let it sit for an hour or longer

Power Supplies

OK

Replace Soon

Replace Now

VTraks are equipped with redundant power supplies. The advantage of dual power supplies is that, should one fail, the other will continue powering the subsystem until the faulty one can be replaced. VTrak is capable of operating on a single power supply. As a result, if one power supply fails you must watch the front panel LEDs or WebPAM PROe in order to become aware of the condition.

The power supplies are hot-swappable, meaning you can leave the VTrak running when you replace the bad one. Be careful, however, to remove the faulty power supply and not the good one, or VTrak will come to an immediate stop and your data will be unavailable until the system is powered and booted again.

As noted above, if a power supply fan fails, you must replace the power supply. Without the fan to cool it, the power supply will overheat and eventually fail anyway.

No tools are required for the procedure. See your page 218 for instructions on replacing a power supply.

Battery

Battery Condition

OK

Replace Soon

Replace now

VTrak uses a battery as backup power for the cache. Should a power failure occur, the battery enables the cache to hold data up to 72 hours. The battery recharges during normal VTrak operation.

In most cases, installing a replacement battery will correct a marginal or failed condition. The battery is located in the cooling unit above the controller. Remove the cooling unit for access. The battery is hot-swappable.

No tools are required for the procedure. See page 224 for instructions on replacing the battery.

Also see “Reconditioning a Battery” on page 114 or page 161.

Controller Enters Maintenance Mode

When a RAID controller encounters and internal problem, it can enter *maintenance mode*. Maintenance mode is only for remedial action in the event of a problem with the controller.

When an controller enters maintenance mode, it goes offline and it will display *Missing* under Readiness Status.

Note that VTrak subsystems with only one controller will always show that the second controller is “Missing.” For VTraks with two controllers, one of the controllers will enter maintenance mode for any of the following reasons:

- The “missing” controller is improperly connected
- The “missing” controller was removed from the subsystem
- One controller has different hardware compared to the other
  - One controller is Fibre Channel and the other is SAS
  - Each controller has a different size of memory
- Each controller sees a different set of configured drives
- Each controller is running a different version of firmware

To obtain this information for a controller, click on the Controller icon, Information tab, and look for Firmware Version and Memory Size.

To access the controller, use a serial connection. If you know the controller’s IP address, you can access the controller using a Telnet connection.

To log into the VTrak CLI:

1. Change your terminal emulation program settings to match the following specifications:
   - Bits per second: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: none
2. Start your PC’s terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.
4. At the Login prompt, type **administrator** and press Enter.
5. At the Password prompt, type **password** and press Enter.
6. At the administrator@cli> prompt, type **ctrl** and press Enter.

   The controller status will display. The controller whose Readiness Status is *Missing* is in maintenance mode.

Connection Problems

When you install your Promise product following the instructions in the *Quick Start Guide* and this *Product Manual*, you should have little trouble getting your equipment to work the first time. But connection problems can arise that are not the User's or Installer's fault. Every conceivable problem cannot be covered in the documentation but some guidelines could be helpful.

Connection problems cause a majority of failures in almost any electrical system. While the installation of the cables and components was correct, they don't function properly, or at all, because:

- A connector is dirty or corroded
- A connector is loose or damaged
- A cable looks OK outside but has an open circuit inside
- The wrong cable was used

VTraks ship with a full set of new cables, as required for each specific model. Be sure to use these components because: 1.) They are the proper ones for your RAID subsystem, 2.) They are in brand-new condition, and 3.) You paid for them with the purchase of your VTrak.

Serial Connections

VTrak uses a serial connection for the command line interface (CLI) and the command line utility (CLU). After you set the IP address, you can access the CLI and CLU through a network connection, also. Normally, users prefer WebPAM PROe because of its graphic user interface. But the CLI and CLU can do the same jobs. And they will work when your network connection is down.

For VTrak, you must use the CLI or CLU to set the Management Port IP address in order for WebPAM PROe to connect with it. See “Setting up the Serial Connection” on page 35. This issue is discussed further under Network Connections (below). See the “Making Serial Cable Connections” on page 32 for more information on making the connection.

The CLI and CLU control and manage but they do not move data. They communicates through a null-modem cable, supplied with the VTrak. A straight-through serial cable will not work for this purpose. You may choose not use the CLI or CLU often and want to disconnect and store the cable. Consider leaving it connected, to be sure it will be there when you need it.

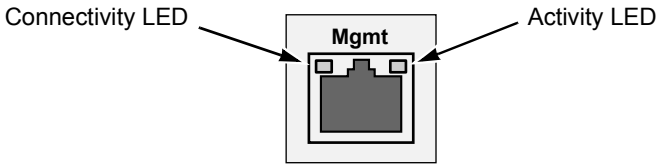
Network Connections

Each controller has an Ethernet (RJ45) Management Port connector on the back of the enclosure. This is a Gigabit Ethernet connector designed to connect to

your network. The VTrak becomes a node on your network like any other PC, server or other component with an IP address.

VTrak ships from the factory an IP address of 10.0.0.2. You must change this address to one that will work with your network. You make the initial IP address setting using the CLI or CLU. See “Setting up the Serial Connection” on page 35.

Figure 15. Management port connection on the RAID controller



LEDs	State			
	Dark	**Amber**	**Green**	**Flashing Green**
Connectivity	10BaseT	1000BaseT	100BaseT	
Activity	No activity			Activity

Note that VTrak Management Port can accept IP address assignments from a DHCP server. Use VTrak’s Command Line Utility (CLU) to enable this feature. If you have not activated DHCP support but there is a DHCP server on your network, there is a chance that it will inadvertently assign the VTrak’s Management Port IP address to another node. You might see a warning to this effect on your PC's monitor. If this happens, WebPAM PROe may not be able to connect. See your network administrator to work out a suitable arrangement.

Fibre Channel Connections

When there is a connection failure, use WebPAM PROe to verify that VTrak sees the initiator(s). See “Viewing Fibre Channel Initiators” on page 82.

If VTrak sees some initiators but not the one you want, the problem is most likely elsewhere in the loop or fabric. If VTrak does not see any initiators:

- Check all of the Fibre Channel connections
- Verify that all nodes are properly connected and powered
- Verify that the fabric router or switch is properly connected powered

The Fibre Channel ports, transceivers, and controller on VTrak function the same as comparable components on other nodes.

For more information, see “Managing Fibre Channel Connections” on page 79.

Browser Does Not Connect to WebPAM PROe

If you successfully setup and connected to WebPAM PROe, then suddenly you can no longer connect, it might be the result of the following three conditions:

- DHCP is enabled on your VTrak's virtual management port
- The DHCP server does not have a dedicated IP address for the VTrak
- The VTrak restarted and your DHCP server assigned a new IP address

You must obtain the new IP Address for the virtual management port in order to direct your browser to the VTrak and start WebPAM PROe.

To access the new IP address:

1. Start your PC's terminal VT100 or ANSI emulation program.
2. Press Enter once to launch the CLI.
3. At the Login prompt, type **administrator** and press Enter.
4. At the Password prompt, type **password** and press Enter.
5. Type **net** and press Enter.

   administrator@cli> **net**

   ```
   ==============================================
   CId    Port  Type   IP              Mask           Gateway        Link
   ==============================================
   Virtual      Mgmt  192.168.10.85  255.255.255.0  192.168.10.1   Up
   ```

   The new virtual management port IP address and other network settings display.

6. Enter the new IP address into your browser to log into WebPAM PROe.

For more information, see "Setting up the Serial Connection" on page 35 and "Logging into WebPAM PROe" on page 42.

Unsaved Data in the Controller Cache

An LED (marked with the ⚠ icon) is provided to inform you that there is data in the cache that has not been saved to non-volatile memory. Such data is sometimes called “dirty,” not to suggest it is corrupted in some way but because it has not been saved to a disk drive.

Figure 16. The VTrak E610f/E310f dirty cache LED

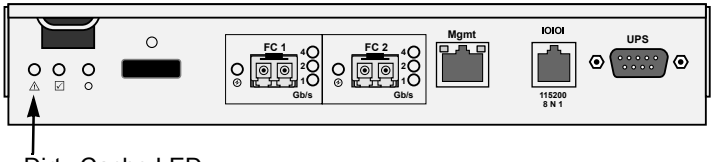
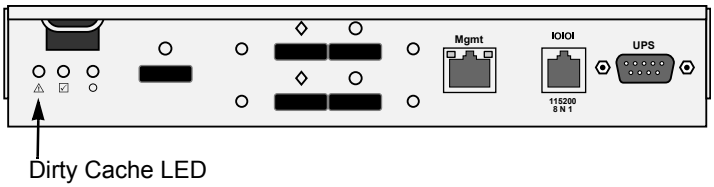


Figure 17. The VTrak E610s/E310s dirty cache LED



If there is unsaved data in the controller’s cache, the Dirty Cache LED shines amber. During this time, do NOT power down the VTrak. Wait until the LED will goes dark.

Chapter 9: Support

This chapter covers the following topics:

- Frequently Asked Questions (below)
- Contacting Technical Support (page 305)
- Limited Warranty (page 308)
- Returning product for repair (page 309)

Frequently Asked Questions

What kind of disk drives can I use with VTrak?

VTrak supports 1.5 and 3.0 GB/s Serial ATA disk drives and 3.0 Gb/s SAS drives.

Can I take the disk drives from my UltraTrak, put them into the VTrak and keep my disk array or logical drive intact?

Yes. UltraTrak and early VTrak subsystems used a proprietary method of disk metadata, stored in the reserve sector of each physical drive. VTrak E-Class uses the industry-standard DDF and has a metadata-to-DDF conversion feature. To use the conversion feature, you must restart the VTrak after installing disk drives from an older system.

VTrak E-Class does not support Parallel ATA (PATA) disk drives.

Note that if you move the disk drives from the VTrak E610f/s or E310f/s to the older subsystems, they will not recognize your disk array or logical drive.

How can I tell when the VTrak has fully booted?

When the VTrak is fully booted up, the Power and FRU LEDs will light up green. If a disk array is present, the Logical Drive LED will light up green also. The Controller heartbeat LED blinks once every two seconds.

Why does VTrak come with a Command Line Utility?

First, to assign your VTrak an IP address in order for the WebPAM management software to connect to it. Second, in the event of a network failure, you can still access the VTrak. Third, some users prefer the Command Line Utility.

WebPAM connection was working OK. But later on, it timed out. What do I do now?

The network condition can time-out for several reasons. When an open connection has no action for a specific amount of time (the Administrator can change it), the connection times-out automatically for security reasons. When you attempt to use WebPAM, it returns to the login screen. Enter your user name and password and click Login, and WebPAM will establish a new connection. See “Making Web Server Settings” on page 91.

I can access the VTrak over my company’s intranet. But I can’t access it from an outside Internet connection. How do I make the Internet connection work?

This condition is not related to VTrak, but is due to your firewall and network connection protocol. Contact your MIS Administrator.

With other Promise VTraks, I used the Server’s IP address in WebPAM to connect with the RAID subsystem. Why is this VTrak E-Class different?

VTrak E-Class has the server software embedded. With the E-Class, you point your browser directly to the VTrak rather than a server. Also, with E-Class, you do not have to create a subsystem because the subsystem already exists.

Why can a RAID 1 logical drive on VTrak consist of only two disk drives?

On VTrak, RAID 1 logical drives work in mirrored physical drive pairs. You could create up to six RAID 1 logical drives. Or you can create a single RAID 10 logical drive with data mirroring and up to 12 physical drives. If you have an odd number of drives but still want data mirroring, use RAID 1E.

See “Installing Disk Drives” on page 17 and “Introduction to RAID” on page 231 for more information on the number of physical drives you can use for each RAID level.

Are logical drives on VTrak limited to 2 TB?

No. But verify that your operating system *supports* logical drives over 2 TB. Also, for the operating system to *recognize* the full capacity of logical drives over 2 TB, you must specify a sector size of 1 KB or larger when you create the logical drive. See “Choosing Sector Size” on page 245 or more information.

I have two UltraTraks and use WebPAM to monitor them. Can I use my existing WebPAM setup to monitor the VTraks also?

No. Use the WebPAM embedded with the VTrak E-Class.

How can I be sure everything is working OK on the VTrak?

Locally: The VTrak enclosure has LEDs on the front to monitor the status of power, field replaceable units (FRUs) and logical drives. When these are green, VTrak is functioning normally.

Remotely: Check the Tree Icons in WebPAM. If there are no yellow or red warning icons displayed, VTrak is functioning normally.

What happens if a logical drive goes critical?

On the front of VTrak, the logical drive LED turns amber and an audible alarm sounds. See “Critical & Offline Disk Arrays” on page 289.

Can VTrak run using just one power supply?

Yes, it is possible to run VTrak on a single power supply. There are two power supplies so that VTrak will continue running if one of the power supply fails. But deliberately leaving one power supply off negates this advantage.

In addition, leaving one power supply off reduces air flow through the VTrak enclosure and can contribute to overheating. Always switch on both power supplies.

Contacting Technical Support

Promise Technical Support provides several support options for Promise users to access information and updates. We encourage you to use one of our electronic services, which provide product information updates for the most efficient service and support.

If you decide to contact us, please have the following information available:

- Product model and serial number
- BIOS, firmware, and driver version numbers
- A description of the problem / situation
- System configuration information, including: motherboard and CPU type, hard drive model(s), SAS/SATA/ATA/ATAPI drives & devices, and other controllers.

Technical Support Services

Promise Online™ Web Site	http://www.promise.com/support (technical documents, drivers, utilities, etc.)

United States

E-mail Support	e-Support On-Line
Fax Support	(408) 228-1097 Attn: Technical Support
Phone Support	(408) 228-1400 option 4
If you wish to write us for support:	Promise Technology, Inc. 580 Cottonwood Drive Milpitas, CA 95035, USA

The Netherlands

E-mail Support	e-Support On-Line
Fax Support	+31 (0) 40 256 9463 Attn: Technical Support
Phone Support	+31 (0) 40 235 2600
If you wish to write us for support:	Promise Technology Europe B.V. Science Park Eindhoven 5542 5692 EL Son, The Netherlands

Germany

E-mail Support	e-Support On-Line
Fax Technical Support	+49 (0) 2 31 56 76 48 - 29 Attn: Technical Support
Phone Technical Support	+49 (0) 2 31 56 76 48 - 10
If you wish to write us for support:	Promise Technology Germany Europaplatz 9 44269 Dortmund, Germany

Italy

E-mail Support	e-Support On-Line
Fax Support	0039 06 367 12400 Attn: Technical Support
Phone Support	0039 06 367 12626
If you wish to write us for support:	Promise Technology Italy Piazza del Popolo 18 00187 Roma, Italia

Taiwan

E-mail Support	e-Support On-Line
Fax Support	+886 3 578 2390 Attn: Technical Support
Phone Support	+886 3 578 2395 (ext. 8811)
If you wish to write us for support:	Promise Technology, Inc. 2F, No. 30, Industry E. Rd. IX Science-based Industrial Park Hsin-Chu 30075, Taiwan (R.O.C.)

China

E-mail Support	e-Support On-Line
Fax Support	+86-10-8857-8015 Attn: Technical Support
Phone Support	+86-10-8857-8085/8095
If you wish to write us for support:	Promise Technology China Room 1205, Tower C Webok Time Center, No.17 South Zhong Guan Cun Street Hai Dian District, Beijing 100081, China

Limited Warranty

Promise Technology, Inc. (“Promise”) warrants that for three (3) years from the time of the delivery of the product to the original end user:

a) the product will conform to Promise’s specifications;

b) the product will be free from defects in material and workmanship under normal use and service.

This warranty:

a) applies only to products which are new and in cartons on the date of purchase;

b) is not transferable;

c) is valid only when accompanied by a copy of the original purchase invoice.

d) Is not valid on spare parts, fans, and power supplies

This warranty shall not apply to defects resulting from:

a) improper or inadequate maintenance, or unauthorized modification(s), performed by the end user;

b) operation outside the environmental specifications for the product;

c) accident, misuse, negligence, misapplication, abuse, natural or personal disaster, or maintenance by anyone other than a Promise or a Promise-authorized service center.

Disclaimer of other warranties

This warranty covers only parts and labor, and excludes coverage on software items as expressly set above.

Except as expressly set forth above, Promise DISCLAIMS any warranties, expressed or implied, by statute or otherwise, regarding the product, including, without limitation, any warranties for fitness for any purpose, quality, merchantability, non-infringement, or otherwise. Promise makes no warranty or representation concerning the suitability of any product for use with any other item. You assume full responsibility for selecting products and for ensuring that the products selected are compatible and appropriate for use with other goods with which they will be used.

Promise DOES NOT WARRANT that any product is free from errors or that it will interface without problems with your computer system. It is your responsibility to back up or otherwise save important data before installing any product and continue to back up your important data regularly.

No other document, statement or representation may be relied on to vary the terms of this limited warranty.

Promise's sole responsibility with respect to any product is to do one of the following:

a) replace the product with a conforming unit of the same or superior product;

b) repair the product.

Promise shall not be liable for the cost of procuring substitute goods, services, lost profits, unrealized savings, equipment damage, costs of recovering, reprogramming, or reproducing of programs or data stored in or used with the products, or for any other general, special, consequential, indirect, incidental, or punitive damages, whether in contract, tort, or otherwise, notwithstanding the failure of the essential purpose of the foregoing remedy and regardless of whether Promise has been advised of the possibility of such damages. Promise is not an insurer. If you desire insurance against such damage, you must obtain insurance from another party.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation may not apply to you.

This warranty gives specific legal rights, and you may also have other rights that vary from state to state. This limited warranty is governed by the State of California.

Your Responsibilities

You are responsible for determining whether the product is appropriate for your use and will interface with your equipment without malfunction or damage. You are also responsible for backing up your data before installing any product and for regularly backing up your data after installing the product. Promise is not liable for any damage to equipment or data loss resulting from the use of any product.

Returning Product For Repair

If you suspect a product is not working properly, or if you have any questions about your product, contact our Technical Support Staff through one of our Technical Services, making sure to provide the following information:

- Product model and serial number (required)
- Return shipping address
- Daytime phone number
- Description of the problem
- Copy of the original purchase invoice

The technician will assist you in determining whether the product requires repair. If the product needs repair, the Technical Support Department will issue an RMA (Return Merchandise Authorization) number.

Important

Obtain an RMA number from Technical Support *before* you return the product and write the RMA number on the label. The RMA number is essential for tracking your product and providing the proper service.

Return ONLY the specific product covered by the warranty (do not ship cables, manuals, diskettes, etc.), with a copy of your proof of purchase to:

USA and Canada:	Promise Technology, Inc. Customer Service Dept. Attn.: RMA # _____ 47654 Kato Road Fremont, CA 94538
Other Countries:	Return the product to your dealer or retailer. Contact them for instructions before shipping the product.

You must follow the packaging guidelines for returning products:

- Use the original shipping carton and packaging
- Include a summary of the product's problem(s)
- Write an attention line on the box with the RMA number
- Include a copy of proof of purchase

You are responsible for the cost of insurance and shipment of the product to Promise. Note that damage incurred due to improper transport or packaging is not covered under the Limited Warranty.

When repairing returned product(s), Promise may replace defective parts with new or reconditioned parts, or replace the entire unit with a new or reconditioned unit. In the event of a replacement, the replacement unit will be under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

Promise will pay for standard return shipping charges only. You will be required to pay for any additional shipping options (such as express shipping).

Appendix A: Useful Information

The appendix covers the following topics:

- SNMP MIB Files (below)
- Adding a Second Controller (page 311)

SNMP MIB Files

Promise supplies two MIB files to integrate the VTrak E610f/s or E310f/s subsystem into your SNMP system. These files are in the SNMP folder on the VTrak Product CD.

The MIB files are:

- FCMGMT-MIB.mib
- raidv4.mib

For help loading the MIB files, see the instructions that came with your MIB browser.

Adding a Second Controller

If your VTrak E-Class subsystem shipped with one controller, you can add a second controller. The second controller must have:

- The same Firmware version as the currently installed controller
- The same amount of SDRAM as the currently installed controller

To obtain this information for the currently installed controller, click on the Controller icon, Information tab, and look for Firmware Version and Memory Size.

Obtain your second controller though Promise Technology. Promise Support will prepare the new controller with Firmware and SDRAM to match your current VTrak subsystem.

When you order the second controller, you should also order a second cache battery to power the new controller's cache in the event of a power failure.

The VTrak subsystem boots its controllers sequentially. With a second controller installed, your subsystem will take about a minute longer to boot. This condition is normal.

Installing a Second Controller

To install a second controller in your VTrak subsystem:

1. Shut down the subsystem.

2. Remove the blank cover from the right controller slot.
3. Carefully slide the new controller into the slot until the handle locks in place.
4. Attach your data and management cables to the new controller, as needed.

   See the “Making Management and Data Connections” on page 21 for cable connection information.
5. Power up the subsystem and launch WebPAM PROe.
6. Click on the Controllers icon in the Tree, then look at the Information tab in Management view.
   - If the controllers’ Operational Status is OK, the installation was successful.
   - If one of the controller’s Operational Status is Missing, one of the controllers went into maintenance mode. See page 298.
7. With the second controller successfully installed, make the following settings:
   - Redundancy Type to Active-Active or Active-Standby. See page 62.
   - LUN Affinity if you choose Active-Active redundancy. See page 107.

Dual Controllers and SATA Drives

If your VTrak subsystem has SATA disk drives installed, you must install an AAMUX adapter on each of the SATA drives.

Without the AAMUX adapter, SATA drives will display Not Usable under Operational Status.

See the “Installing Disk Drives” on page 17 for installation instructions.

This condition does not apply to SAS disk drives.

Obtain AAMUX adapters though Promise Technology.

Installing a Second Cache Battery

The cache battery comes as an assembly, with attaching screws and a wiring harness. Install the new cache battery into the cooling unit above the new controller.

To install a new cache battery:

1. On the cooling unit above the new controller, press the release button and pull the handle downward.
2. Pull the cooling unit out of the VTrak enclosure.
3. Loosen the thumbscrews. A retainer keeps the thumbscrews in place.
4. Grasp the top section near the thumbscrews and lift it off the bottom section.
5. Place the battery assembly into the bottom section of the cooling unit as shown in Figure 1 (E610f/s) or 2 (E310f/s).
6. Install the two screws that came with the battery assembly as shown.
7. Attach the wiring harness from the battery assembly to the circuit board in the cooling unit as shown.

Figure 1. IE610f/s cache battery installation

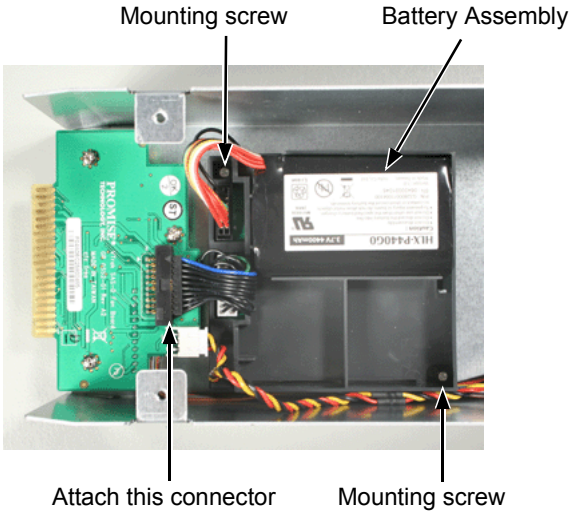
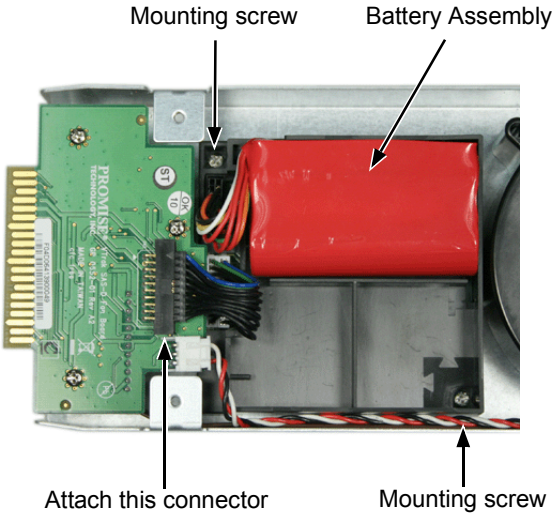


Figure 2. E310f/s cache battery installation



8. Place the top section of the cooling unit onto the bottom section and tighten the thumbscrews.
9. Carefully slide the cooling unit into the enclosure.
10. Gently press the handle in and upward until it locks.

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